NUCLEAR CRITICALITY SAFTEY PROGRAM (NCSP)

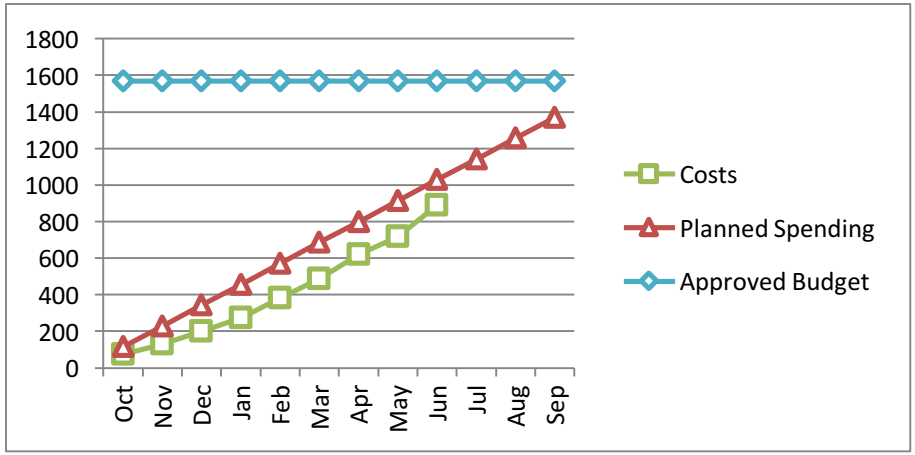
FY2018 Q3 QUARTERLY REPORTS

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: AM1/AM2/AM4 (MCNP/NJOY/USL Comparison Study)
M&O Contractor Name: LANL
Point of Contact Name: Bob Margevicius / Bob Little
Point of Contact Phone: 505-665-8965 / 505-665-3487

Reference: B&R DP0902090
Date of Report: July 23, 2018

BUDGET



1. Carryover into FY-2018 = $0.
2. Approved FY-2018 Budget = $1,567,000 (Includes carryover from FY-2017).
3. Actual Spending through the end of this quarter in FY-2018 = $888,908.
4. Projected carryover into FY 2019 = $200,000.

MAJOR ACCOMPLISHMENTS

MCNP

- **Education**
  - MCNP Criticality class at Y-12, 25 students.
  - Thesis advisor for 2 UNM graduate students working in area of criticality calculations
  - 3 graduate student summer interns working on NCSP tasks (region dependent sensitivities, subcritical multiplication, benchmarks)

- **R&D Work, continued to investigate & develop:**
  - region-dependent sensitivity-uncertainty data to NCS validation
  - fission matrix methods to diagnose & accelerate MC source convergence
  - diagnostic tests for undersampling & clustering
  - impact of correlated fission multiplicity models in criticality calculations
  - studies into the validation for chlorine.
  - impact of excluding benchmark outliers on the Whisper selection of similar benchmarks & on the Whisper baseline-USLs.
  - new & improved methods for static-alpha eigenvalue calculations

- **MCNP Data Libraries**
  - Created website to distribute nuclear data (https://nucleardata.lanl.gov)
  - Completed processing, validation, documentation, and distribution of ENDF/B-VIII.0-based continuous energy neutron and thermal scattering ACE files (see documents below)

- **Support & Maintenance**
  - Code modernization effort - Efforts are in progress to improve SQA, implement some MCNP-2020 features, & upgrade portions of MCNP6. Includes more formal planning, design proposals, improved code review, SQA tools, and more. (Most of funding is non-NCSP.)

- **Professional society meetings**
  - ANS 2018 Summer meeting – paper & presentation on static-alpha eigenvalue calculations.
  - Attended WPEC in Paris in May and participated in several different subgroups.

- **Reports & Publications (available in MCNP Reference Collection on web)**
  - J. L. Conlin, W. Haeck, D. Neudecker, et al., "Release of ENDF/B-VIII.0-Based ACE Data Files," Los Alamos National Laboratory report LA-UR-18-24034 (2018).
  - D. K. Parsons, "NJOY Processing of ENDF/B-VIII.0 Thermal Scattering Files," Los Alamos National Laboratory report LA-UR-18-25096 (2018).
  - F.B. Brown, M.E. Rising, J.L. Alwin, “Verification of MCNP6.2 for Nuclear Criticality Safety Applications”, submitted to ANS 2018 Winter meeting, LA-UR-18-25536 (2018)
  - F.B. Brown, M.E. Rising, J.L. Alwin, “Verification of the MCNP6.2 Release for Nuclear Criticality Safety Applications”, LA-UR-18-25535 (2018)
  - C.J. Josey, “General Improvements to the MCNP Alpha-Eigenvalue Solver”, LA-UR-18-22738 (2018)
  - C.J. Josey, F.B. Brown, “A New Monte Carlo Alpha-Eigenvalue Estimator with Delayed Neutrons”, ANS 2018 Summer meeting, paper LA-UR-18-20541, talk LA-UR-18-25149 (2018)
  - C.J. Josey, F.B. Brown, “Bias in Monte Carlo Alpha-Eigenvalue Calculations”, submitted to ANS 2018 Winter meeting, LA-UR-18-24670 (2018)

	○ C.J. Josey, F.B. Brown, "Fitting Nuclear Data with Chebyshev Polynomials", submitted to ANS 2018 Winter meeting, LA-UR-18-24669 (2018) ○ J.A. Arthur, et al., "Validating the performance of correlated fission multiplicity implementation in radiation transport codes with subcritical neutron multiplication benchmark experiments", Annals of Nuclear Energy , Vol.120, p.348-366, LA-UR-17-31332 (2018) ○ J.A. Arthur, et al., "Validation of MCNP6 Using Subcritical Benchmark Experiments", Prepared for Advances in Nuclear Nonproliferation Technology and Policy Conference 2018, LA-UR-18-24470 (2018) ○ M.T. Andrews, A. Sood, M.E. Rising, "MCNP6.2 Correlated Fission Capabilities and Associated Packages: MCNPTools, Intrinsic Source Constructor, and Detector Response Function Toolkit", Prepared for Advances in Nuclear Nonproliferation Technical and Policy Conference 2018, LA-UR-18-23892 (2018) ○ P.T. Grechanuk, M.E. Rising, T. Palmer, "Using Machine Learning Methods to Predict Bias in Nuclear Criticality Safety", Prepared for Journal of Computational and Theoretical Transport, LA-UR-18-24800, (2018) **NJOY** • We continue to respond to user questions and requests for NJOY, providing updates as required. • Completion of the MCNP ENDF/B-VIII.0 libraries required updates to NJOY, which has been updated to version 2016.39. • NJOY 21 work continues with a focus on resonance reconstruction and Doppler broadening.

NCSP Quarterly Progress Report (FY-2018 Q3)

LANL AM Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Support MCNP6 users (AM1)		
	Support NJOY users (AM2)		
	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1, AM2)		
	Provide reports on summer intern work accomplished (AM1)		
	Develop a plan to distribute ACE files independent of MCNP releases (AM1)		
Q2	Support MCNP6 users (AM1)		
	Support NJOY users (AM2)		
	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1, AM2)		
	Issue an MCNP V&V report (AM1)		
Q3	Support MCNP6 users (AM1)		
	Support NJOY users (AM2)		
	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1, AM2)		
	Provide training course on theory and practice of Monte Carlo criticality calculations with MCNP6 (AM1)		
	Release MCNP ACE data libraries corresponding to ENDF/B-VIII.0 (AM1)		
Q4	Support MCNP6 users (AM1)		

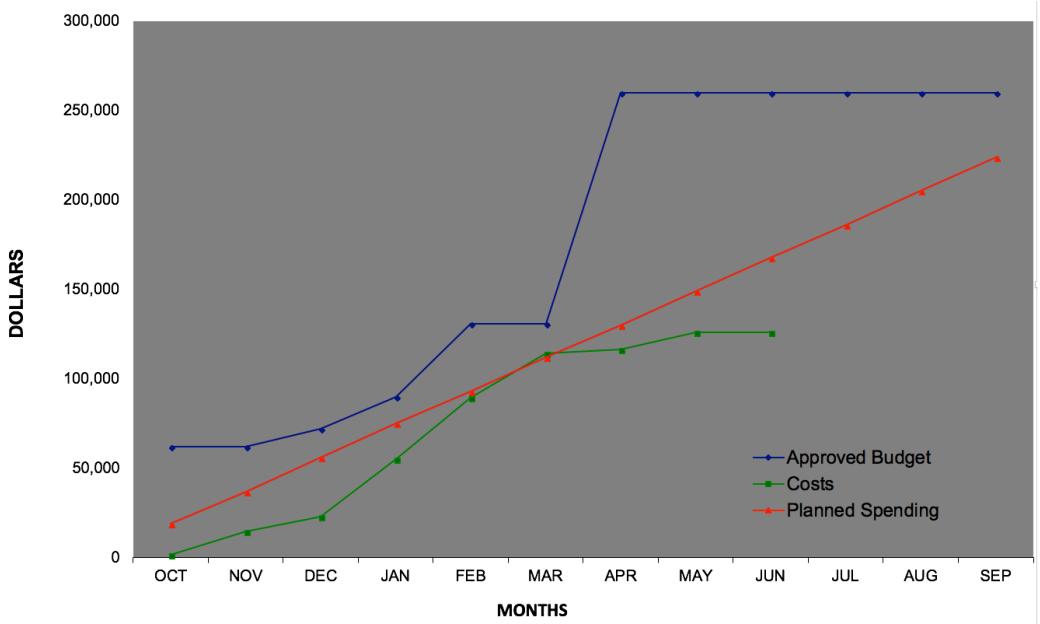
	Support NJOY users (AM2)		
	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1, AM2)		
	Develop Doppler broadening capabilities in NJOY21 (AM2)		
	Issue report on the Sensitivity-Uncertainty Comparison Study (AM4)		
	Develop a report for the NCSP manager on MCNP maintenance and modernization progress, the implementation of a parallel PTRAC capability, and the implementation of a Fission Matrix automated convergence checking capability (AM1).		
	Issue a report on development and maintenance of the NJOY nuclear data processing code system (AM2).		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtasks: Analytical Methods,
LLNL Analytical Methods (AM2), Sliderule (AM3), Analytic Benchmarks (AM6)
M&O Contractor Name: Lawrence Livermore National Laboratory
Point of Contact Name: David Heinrichs
Point of Contact Phone: (925) 424-5679

Reference: B&R DP0909010
Date of Report: July 25, 2018

BUDGET



1. Carryover into FY-2018 = $17,016
2. Approved FY-2018 Budget = $260,016 (Includes carryover from FY-2017)
3. Actual Spending through the end of this quarter (in FY-2018) = $126,038
4. Projected carryover into FY-2019 = $21,000 (8%)

MAJOR ACCOMPLISHMENTS

LLNL Analytical Methods (AM1)

- Successfully processed JEFF3.3 data in ACE format as received from OECD NEA to yield the COG libraries JEFF3.3 (neutron cross sections), PT. JEFF3.3 (probability tables for the unresolved resonance region), and T.JEFF3.3 (thermal scattering laws).
- Successfully processed 'POINT 2018' ENDF/B-VIII.0 data in ENDF-6 format from PREPRO 2018 as described in IAEA-NDS-227 (April 2018) to yield the COG cross-section library ENDFB8R0.
- Successfully processed MCNP library data in ACE format as received from LANL to yield COG libraries MCNP.80nc (neutron cross sections), PT. MCNP.80nc (probability tables for the unresolved resonance region) and T.MCNP.80nc (thermal scattering laws). Alerted J. Conlin to discrepancies noted in the NJOY-processed thermal scattering law data for SiO_2.
- Provided high-precision COG benchmark results using ENDF/B-VII.1 to Isabelle Duhamel (IRSN) for a total of 1,301 ICSBEP benchmark cases for inclusion in the *Benchmark Inter-comparison Study* as follows:

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PU:  512     U233: 129     MIX:  21
HEU: 454     IEU:  185     LEU:   0
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- Preparation of additional benchmark cases are in progress.

Criticality Sliderule (AM3)

- Completed all calculations for the 3rd phase of the Criticality Sliderule project last period. COG results for all phases of the project are included in the *draft* IRSN summary report 'Update of the Nuclear Criticality Sliderule: Technical Basis' distributed for comment on June 8, 2018. LLNL reviewed this report and provided comments
- Received *Update of the Nuclear Criticality Slide Rule Calculations – Studies with Common Shielding Materials* on June 26, 2018 and provided comments and minor corrections to Thomas Miller (ORNL), lead author.

Analytical Benchmarks (AM6)

- Defer to next summer (FY-2019) due to delays related to Continuing Resolution and personnel changes to LLNL Supply Chain Management.

NCSP Quarterly Progress Report (FY-2018 Q3)

LLNL AM Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

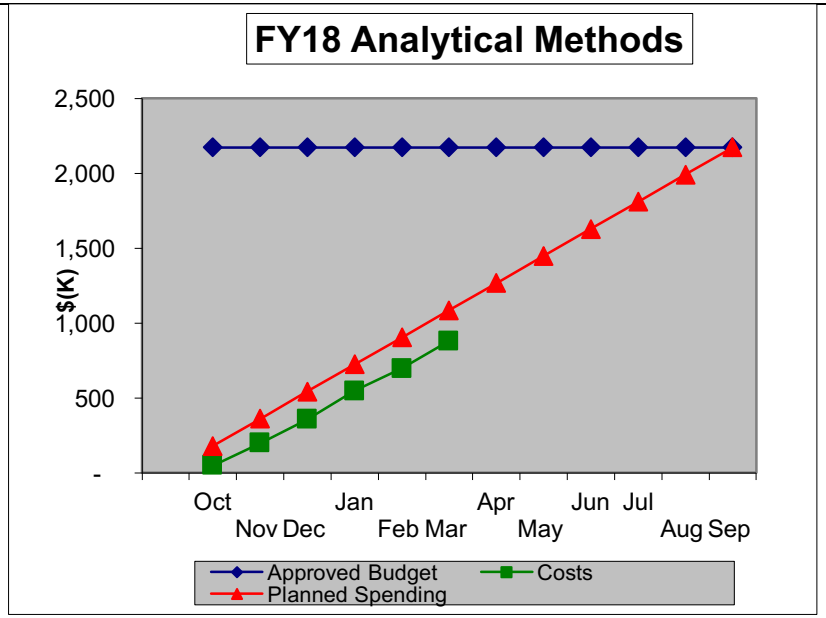
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide status on LLNL AM activities in NCSP Quarterly Progress Reports (AM2, AM3, and AM6).		
	Provide an annual report on the LLNL multiphysics capability development. (AM2).		**In progress – due Q4**
Q2	Provide status on LLNL AM activities in NCSP Quarterly Progress Reports (AM2, AM3, and AM6).		
	Provide an annual report on the LLNL multiphysics capability development. (AM2).		**In progress – due Q4**
Q3	Provide status on LLNL AM activities in NCSP Quarterly Progress Reports (AM2, AM3, and AM6).		
	Provide an annual report on the LLNL multiphysics capability development. (AM2).		**In progress – due Q4**
Q4	Provide status on LLNL AM activities in NCSP Quarterly Progress Reports (AM2, AM3, and AM6).		
	Provide an annual report on the LLNL multiphysics capability development. (AM2).		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: ORNL – AM1, 2, 3, 6, 9, 11, 13, 14
M&O Contractor Name: ORNL
Point of Contact Name: Doug Bowen
Point of Contact Phone: (865) 576-0315

Reference: DP0902000/ORNL
Date of Report: July 17, 2018

BUDGET



1. **Carryover into FY 2018** = $50K
2. **Approved FY 2018 Budget** = $2172K (includes carryover
3. **Actual spending for 1st Quarter FY 2018** = $357K
4. **Actual spending for 2nd Quarter FY 2018** = $523K
5. **Actual spending for 3rd Quarter FY 2018** = $574K
6. **Actual spending for 4rd Quarter FY 2018** = $ –

MAJOR ACCOMPLISHMENTS

AM1 – Distribution of available and newly packaged software

- Distributed 742 software packages and updated 6 software package.
- 184 SCALE, 347 MCNP®, and 0 COG packages distributed.
- RSICC quarterly report issued.

AM2 - IRSN Area of Collaboration – SCALE/KENO/TSUNAMI

- **Status report on all ORNL participation in US and International analytical methods collaborations and travel.**
  - SCALE Stats:
    - Answered 449 requests for user assistance through scalehelp@ornl.gov.
    - Since 2004, there have been over 14,000 distributions of SCALE to 8753 unique users in 58 nations.
    - Since April 2016, the distribution centers have issued licenses for 4,170 copies of the latest SCALE version.
    - Held a week of SCALE training at the University of Florida in April. Total attendance - 16.
    - Held a week of SCALE training at the Y-12 National Security Complex in June. Total attendance – 16.
  - Released SCALE 6.2.3 update with numerous features enhancements for criticality safety users including:
    - An issue was identified in SCALE 6.1-6.2.2 with KENO-V.a in which unexpected behavior occurs if the input assigns albedo boundary conditions to a non-cuboid region, contrary to the documentation, which states "Albedo boundary conditions are applied only to the outermost region of a problem. In KENO V.a this geometry region must be a rectangular parallelepiped." This error is now properly caught by input checking in SCALE 6.2.3.
    - The multigroup cross section self-shielding method selection logic (BONAMI or CENTRM) includes improved consistency across all sequences and now enables the use of BONAMI-only methodology for faster calculations or for cases in which the CENTRM methodology is not suitable.
    - Numerous other stability, usability, and documentation enhancements are also included.
    - A download link is provided free of charge for those who have previously licensed SCALE 6.2
    - Details are provided at:

- https://www.ornl.gov/scale/scale/scale-623-update-0
- Distributed 30-page SCALE Newsletter with the following contents:
  - Polaris Enhancements
  - SCALE 6.2.3 Update
  - NEWT User Guidance
  - SCALE 6.3 Development for Advanced Reactors and Advanced Technology Fuels
  - Employee Spotlight: William J. (B.J.) Marshall
  - Recent SCALE Publications
  - SCALE Team Structure
  - SCALE Quality Assurance Program
  - Technical Support and Training
  - SCALE Users' Group Workshop 2017
  - Save the Date for SCALE Users' Group Workshop 2018
  - Recent SCALE Training Events
  - Welcome New SCALE Users
  - https://www.ornl.gov/sites/default/files/PB1800024_Ilas-SCALE-news04-02-18.pdf
- Scheduled Annual SCALE Users' Group Workshop for August 27 – 29, 2018 at the ORNL Conference Center.
  - The workshop will provide a highly interactive forum for a fruitful exchange between SCALE users, developers, and sponsors and will include a mix of invited and contributed presentations, open discussions, tutorial sessions, and technical tours.
  - The draft agenda and registration is available at: https://scalemeetings.ornl.gov/
- Continued modernization initiatives for SCALE 6.3 including:
  - Testing ENDF/B-VIII.0 nuclear data
  - Investigating methods for improved used of covariance data, especially in light of the new ENDF/B-VIII.0 disclaimer regarding the suitability of covariance data for use in applications
  - Integration of Shift Monte Carlo code modernized alternative to KENO V.a, KENO-VI, and Monaco for all SCALE sequences
  - Updating USLSTATS package to modern software standards and integration with the Fulcrum user interface
  - Addition of 3D geometry visualization capabilities in Fulcrum
  - SCALE 6.3Beta1 is planned for the fall of 2018

AM3 - IRSN Area of Collaboration – AMPX

- Status report on all ORNL participation in US and International analytical methods collaborations and travel.

- Attended the WPEC meeting in Paris and reported on the progress of GNDS processing in AMPX. A Talk each was given in the GNDS governance sub-group (EG-GNDS) and the sub-group that is tasked with developing a GNDS API (SG-43).
- Work continued on the capability of the AMPX code to read the GNDS data files. We focused on reading the covariance data for resonance parameters. AMPX can now read all cross section covariance data and resonance parameters covariance matrices from GNDS. We processed the covariance data from ENDF formatted files and GNDS formatted files and compared the results. Differences were traced back to inconsistencies in the FUDGE code, developed by LLNL. The results were discussed with the developers with FUDGE. Once we get the updated version of FUDGE, the comparison will continue. In addition, we started work on processing the kinematic data and read the elastic and discrete inelastic kinematic data. Comparison of the results if ongoing.
- AMPX has traditionally been distributed on LINUX and MacOS only. However, it would be advantages to be able to run AMPX on Window machines. Work started to accomplish this, and the code can now be compiled and run on Windows. However, not all unit tests pass and work continues in the investigation of those differences.

AM6 – AWE and IRSN Area of Collaboration – SlideRule (Thomas Miller, Lead)

- Status **report on ORNL support**
  - An initial set of MAVRIC/Monaco dose calculations for the FY18 work were completed and compared to the MCNP (IRSN) and COG (LLNL) results. A few discrepancies were found between the different code results, but most of these have been attributed to modeling errors. Work is ongoing to address these discrepancies.
  - MAVRIC/Monaco FY18 sky shine simulations have not been completed yet.
  - A paper discussing our preliminary FY18 results were submitted to RPSD-2018.

AM9 – IRSN Area of Collaboration – TSUNAMI

- Status **report on ORNL support (Thomas Miller, Lead)**
  - IRSN selected these ICSBEP benchmarks to use as our applications for this comparison of baseline USL: HMF-013, HST-001 case 8, PMF-022, PST-001 case 1. These were selected because all labs involved have models and because the measurements and uncertainties appear to be of good quality.

AM11 – U. of Arizona and LLNL Area of Collaboration

- We have not yet heard from LLNL/U. of Arizona to initiate this task. This task has been assigned and contact with LLNL will be made in the near future.

	AM13 – U of Florida Area of Collaboration ▪ Contract has been set up with U. of Florida and work has been started. Meetings have been held with S. Goluoglu and ORNL staff to plan out the work for the student. Because this task was affected by the CR and was significantly delayed, the focus will shift slightly to a similar, but different, scope. We will process the ENDF/B-VIII.0 evaluated cross section libraries using the AMPX code system to generate and test the continuous energy and problem-independent multigroup cross section libraries to be included in the next release of SCALE code system. We will first acquire the official ENDF/B-VIII.0 evaluated data library. We will then process the evaluated data library using AMPX code system to produce continuous energy and multi-group neutron and gamma cross-section libraries that will be candidate libraries for release with the SCALE code system. We will perform rigorous verification and validation tests and compare the performance of the new libraries against previous (ENDF/B-VII.1-based) libraries. Finally, the test results will be documented and published as appropriate. This university task will fund an MS student over the next two years (ends FY2019). **AM14 - U. of Tennessee Area of Collaboration** ▪ Contract has been set up with U. of Tennessee and work has been started. This university task will fund an MS student over the next two years. Scope from 5YP has changed somewhat as a result of the CR – some of the work had already been completed. This work involves converting continuous energy CSAS or multigroup TSUNAMI-3D models from (LST experiments [19 total] in VALID) into CE TSUNAMI-3D models. The CE TSUNAMI methods IFP and CLUTCH will be used to generate SDF files. Further, work is also proceeding for validation of heavy water-moderated experiments from the ICSBEP handbook (15 evaluations with 87 total cases).

NCSP Quarterly Progress Report (FY-2018 Q3)

ORNL AM Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q3	Continue distribution of available and newly packaged software to the NCS community requesters (at no direct cost to them) and provide distribution totals quarterly. (AM1)		AM1 report is provided above under major accomplishments.
	Provide status reports on ORNL participation in US and International Analytical Methods collaborations and provide brief trip summary report to NCSP Manager on items of NCSP interest. (AM2, AM3)		AM2/3 report includes information about international analytical methods collaborations. In particular WPEC was attended in Paris, FR. Also, the NCSP execution manager met with AWE/IRSN/JRC-Geel personnel to discuss NCSP collaborations, including SCALE (AM2) and AMPX (AM3).
	Provide a status report on ORNL support on a new SlideRule accident response tool (AM6).		A report from T. Miller is included in this report for the SlideRule task. There is no defined end to this task at the current time.
	Provide status on ORNL AM activities in NCSP Quarterly Progress Reports. (AM1, AM2, AM3, AM6, AM9)		A report is provided under the Major Accomplishments section of this report for AM1, AM2, AM3, AM6, and AM9.
	Provide a status report of the progress on the establishment of 1D analytical benchmarks (Univ. of Arizona); provide a progress report of providing COG Monte Carlo Results (LLNL); and Provide a progress report of SCALE Monte Carlo results (ORNL). (AM11)		There has been no information from LLNL to initiate this task in FY2018. Successful completion of this task is dependent upon LLNL progress. T. Miller is the lead.
	Provide a status report for running verification test cases and comparing to previous results. (AM13)		Work is in progress – work delayed due to the FY2018 CR. More information is available in the Major Accomplishments section.

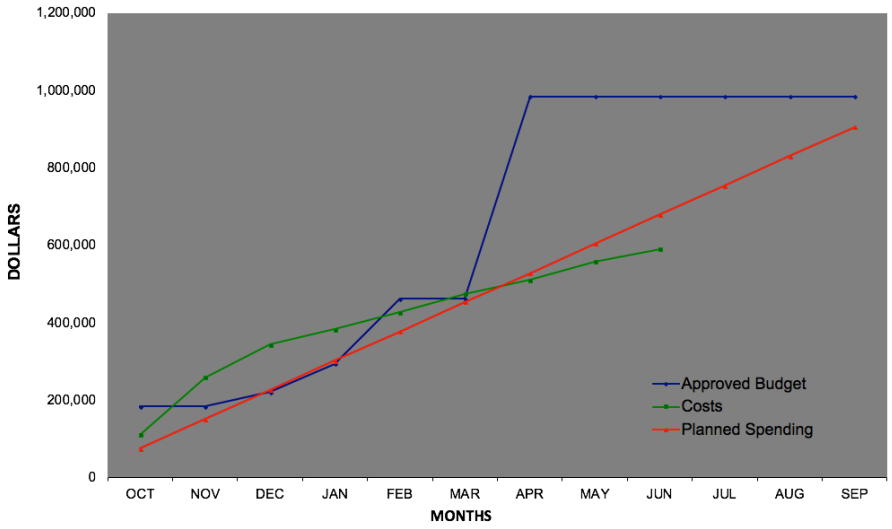
	Provide a status report for evaluating any additional sensitivity parameters, documenting generation, review and submission to VALID, repeating procedure for additional evaluations as time and budget permits, and submitting paper to winter ANS or NCSP professional conference. (AM14)		Work is in progress – work delayed due to the FY2018 CR. More information is available in the Major Accomplishments section.

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtasks: Information Preservation & Dissemination, ICSBEP (IP&D1), Website and Red Net (IP&D2)
M&O Contractor Name: Lawrence Livermore National Laboratory
Point of Contact Name: David Heinrichs
Point of Contact Phone: (925) 424-5679

Reference: B&R DP0909010
Date of Report: July 25, 2018

BUDGET



1. Carryover into FY-2018 = $0
2. Approved FY-2018 Budget = $984,000 (Includes carryover from FY-2017)
3. Actual Spending through the end of this quarter in FY-2018) = $590,399
4. Projected carryover into FY-2019 = $79,000 (8%)

MAJOR ACCOMPLISHMENTS

ICSBEP Accomplishments (IP&D1)

- OECD NEA plans to issue the 2017 edition of the ICSBEP Handbook in September (!) and provide LLNL 200 copies for LLNL to distribute to NCSP members and collaborators.
- LLNL co-authored *Evaluation of the Criticality and Reaction Rate Benchmark Experiments Utilizing UO2F2 Aqueous Solution of Intermediate Enrichment in Spherical Geometry at ORNL*, which has been submitted for publication in Progress in Nuclear Energy.

Website Accomplishments (IP&D2)

- Providing website updates as requested by NCSP Management. Enhancing 'honey pot' security features on web-based forms with testing and approval by LLNL Cyber Security.
- LLNL created 5 privileged accounts for access to the IER/CEdT database for Tim Wynn and Tommy Adkins (ORNL); and Tyson Deschamp, John Rissler and Brad Wenrich (DOE) to facilitate its transfer to G2.
- Fixed Red Hat Satellite 6 patching services for the legacy websites https://cedt.llnl.gov and https://ncsp-backup.llnl.gov.

Red Net Accomplishments (IP&D2)

- Performed required updates to NTS-SLAN/NCERC classified network images and servers to ensure the latest Microsoft patches were installed as required and performed required monthly "authenticated" scans for NCERC network devices. Responded to a LANL AO request for vulnerability scans on NTS-LANL and all PADGS systems for certification.
- Removed "old" laptops/workstations for NTS-SLAN from DAF and Mercury for return to LANL for destruction. Deployed Windows 10 images for "new" NTS-SLAN workstations. Also deployed new NTS-SLAN printers to DAF and Mercury and relocated Mercury NTS-SLAN workstations to the "new" Limited Area Classified Computing Center in Building 23-600. Also relocated the NTS-LANL servers from the DAF VTR to the Mercury VTR for better power stability. Added 5 new NTS-SLAN users. Revised and submitted the NTS-SLAN Cyber Security Plan accommodating Sigma 15/20 for review and approval.
- Provided equipment inspections, certifications and data transfers in support of:
  - IER-435: UNESE Project Irradiations at NCERC (LANL)
  - IER-462: NCSP hands-on training courses (LANL)
  - IER-464: NCSP hands-on training courses (LLNL)
  - IER-465: Non-NCSP NDSE Experiments in FY16 and FY17 (LANL)
  - IER-466: NCERC Operational Support (LANL IE1)
  - IER-472: Non-NCSP CNEC Measurements 7/31 Week (LANL)
  - IER-476: KRUSTY HOT Operations (LANL)
  - IER-492: Non-NCSP Nuclear Smuggling Detector Development May 2018 (LANL)
  - IER-493: Non-NCSP LANL Student Tour July 2018 (LANL)

NCSP Quarterly Progress Report (FY-2018 Q3)

LLNL IP&D Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

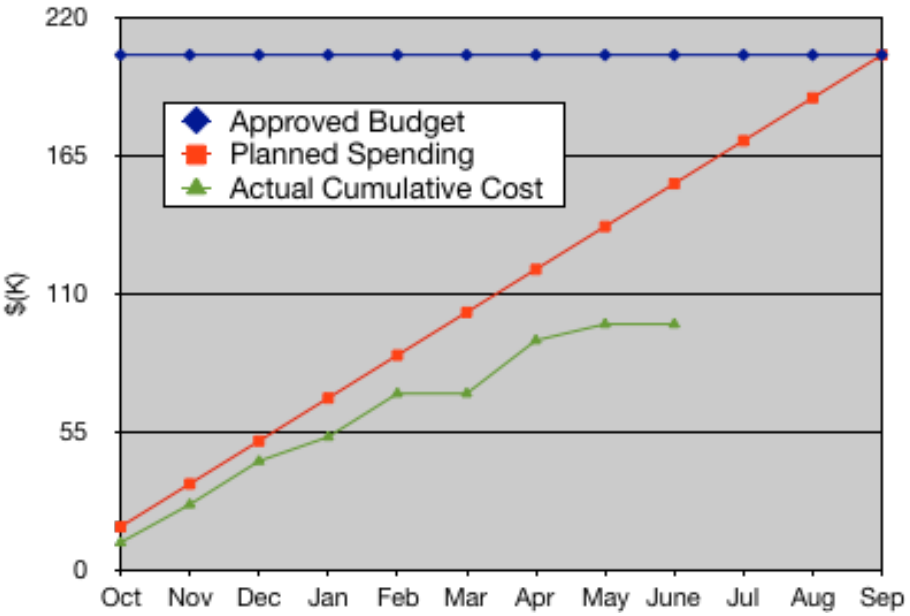
Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IP&D1)		
	Provide status reports on LLNL participation in US and International IP&D collaborations (including ICSBEP) and provide brief summary report to NCSP Manager on items of NCSP interest. (IP&D1)		
	Maintain, operate and modernize he NCSP website, databases, and provide user assistance as required. (IP&D2)		
Q2	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IP&D1)		
	Provide status reports on LLNL participation in US and International IP&D collaborations (including ICSBEP) and provide brief summary report to NCSP Manager on items of NCSP interest. (IP&D1)		
	Maintain, operate and modernize he NCSP website, databases, and provide user assistance as required. (IP&D2)		
Q3	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IP&D1)		Evaluations in progress for the ICSBEP Meeting in October 2018 are **IER422** [SCRaP], **IER206** [BUCCX], **IER451** [BUCCX-Ti], I**ER407** [ISSA]
	Provide status reports on LLNL participation in US and International IP&D collaborations (including ICSBEP) and provide brief summary report to NCSP Manager on items of NCSP interest. (IP&D1)		
	Maintain, operate and modernize the NCSP website, databases, and provide user assistance as required. (IP&D2)		Chuck Lee to visit ORNL on August 6-10, 2018 to transfer IER/C_EdT database to NNSA G2.
Q4	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IP&D1)		
	Provide status reports on LLNL participation in US and International IP&D collaborations (including ICSBEP) and provide brief summary report to NCSP Manager on items of NCSP interest. (IP&D1)		
	Maintain, operate and modernize he NCSP website, databases, and provide user assistance as required. (IP&D2)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: Nuclear Data BNL Task 1 M&O Contractor Name: BNL Point of Contact Name: David Brown Point of Contact Phone: 631-344-2814	Reference: B&R DP 0902090 Date of Report: July 25, 2018

BUDGET



1. Carryover into FY-2018 = $15,478
2. Approved FY-2018 Budget = $204,912 (Includes carryover from FY-2017)
3. Actual Spending through the end of this quarter in FY-2018 = $117,891

MAJOR ACCOMPLISHMENTS

- ENDF/B-VIII.0 released 2 Feb 2018 (Happy 50th CSEWG!)
- ENDF/B-VIII.0 release page now up on NNDC website:
  - includes links to GNDS, POINT2018 and ACE formatted files.
  - Includes errata page

NCSP Quarterly Progress Report (FY-2018 Q3)

BNL ND Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

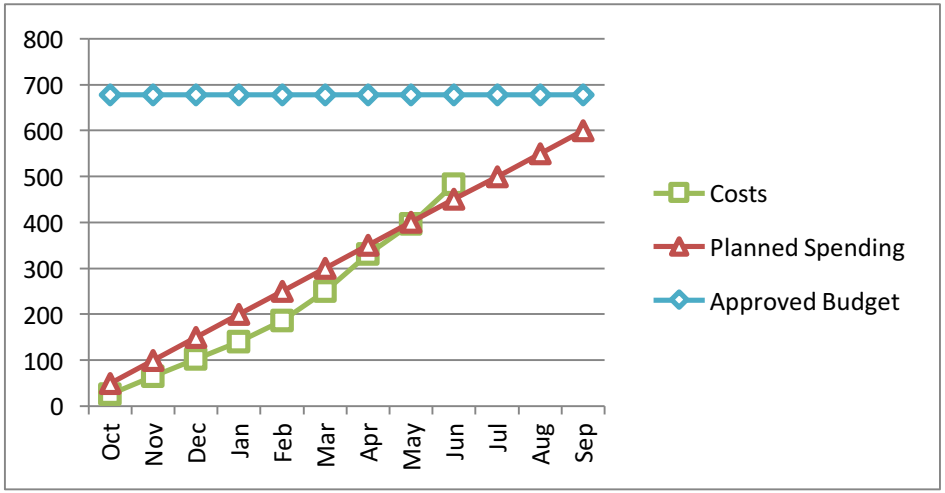
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required and provide status reports on all nuclear data support activities to the NCSP Manager. (ND1)		• ENDF/B-VIII.0 to be released on Feb. 2, 2018, approximately the 50th anniversary of the first ENDF release (1st release was June 1968!) • Graphite changes in β6 & β7 necessitate a report/article describing changes and their testing.
Q2	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required and provide status reports on all nuclear data support activities to the NCSP Manager. (ND1)		• Awaiting server hardware upgrades before beginning to improve ADVANCE • CSEWG recommends improvements to ENDF/B evaluation review process • Waiting for official LANL ACE files for ENDF/B-VIII.0
Q3	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required and provide status reports on all nuclear data support activities to the NCSP Manager. (ND1)		• **New ADVANCE server delivered (to the wrong building!). Will be installed along with other elements of NNDC computing upgrades.** • **Official LANL ACE files now linked to rest of ENDF release** • **Upgrade of ADVANCE software is in progress** • **Posting of ad for post-doc delayed by Office of Science**
	If mandated by CSEWG, release new ENDF library. (ND1)		• ENDF/B-VIII.0 released 2 Feb 2018 • Happy 50th CSEWG! • ENDF/B-VIII.0 release page now up on NNDC website
Q4	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required and provide status reports on all nuclear data support activities to the NCSP Manager. (ND1)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: ND1 (Nuclear Data Evaluation and Testing)
M&O Contractor Name: LANL
Point of Contact Name: Bob Margevicius / Bob Little
Point of Contact Phone: 505-665-8965 / 505-665-3487

Reference: B&R DP0902090
Date of Report: July 23, 2018

BUDGET



- Carryover into FY-2018 = $0.
- Approved FY-2018 Budget = $678,000 (Includes carryover from FY-2017).
- Actual Spending through the end of this quarter in FY-2018 = $482,429.
- Projected carryover into FY 2019 = $78,000.

MAJOR ACCOMPLISHMENTS

- The Pu-239 P(nu) evaluation for incident neutron energies from thermal up to 20 MeV has been completed earlier, and included in ENDF/B-VIII.
- U-235 and Pu-239 PFNS: we are working with the Chi-Nu team to understand/interpret the angular distributions of the prompt fission neutrons at higher incident energies where multi-chance fission and pre-equilibrium components both play an important role in the angular distributions of the neutrons in the lab frame.
- The deterministic technique to calculate PFNS is on-going as well. Although the developed technique is consistent with the fission product yields, and gives a reasonable average energy, the issue of "too-soft" PFNS remains. This was investigated by changing model parameters, but we are still not able to increase the tail of the spectrum. This needs further attention.
- We performed benchmark simulations to validate ENDF/B-VIII.0 for several LLNL pulsed sphere experiments.
- We will write a report on the use of Machine Learning techniques for nuclear data evaluation in Q4. Meanwhile, we can report that regular meetings (~twice a month) have been held between nuclear physicists, evaluators, transport code developers, and statisticians on this emerging topic. From such meetings has emerged a proposal to develop ML tools to use in nuclear data evaluations.
- Several LANL staff attended WPEC in Paris in May and participated in different subgroups.

	• A new calculation of the U-236 capture cross section has been done based on recent DANCE data and updated photon strength functions. • The spectra for the 6Li(n,n')d alpha reaction were changed from the pseudo-level representation that has been used in the file for decades to tabulations of the n,d, and alpha distributions calculated from a three-body resonance model that had been adjusted to fit experimental data. This new representation improves the energy balance considerably, and may help resolve problems in some of the prompt fission neutron spectra measured relative to the n+6Li reaction.

NCSP Quarterly Progress Report (FY-2018 Q3)

LANL ND Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

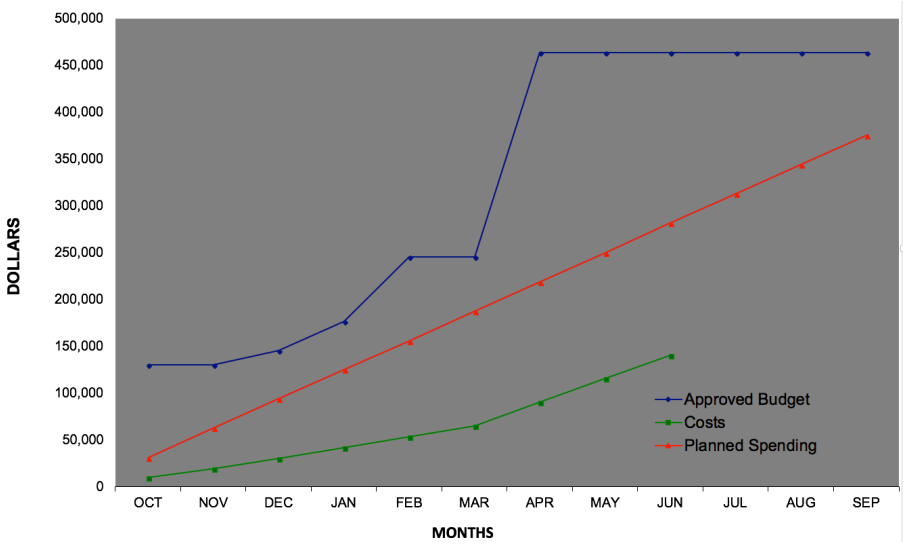
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide status reports on LANL participation in US and International Nuclear Data collaborations. (ND1)		
	Conduct CSEWG Data Evaluation Committee session. (ND1)		
	Report data testing results with ENDF/B-VIII.0 cross sections. (ND1)		
Q2	Provide status reports on LANL participation in US and International Nuclear Data collaborations. (ND1)		
Q3	Provide status reports on LANL participation in US and International Nuclear Data collaborations. (ND1)		
Q4	Provide status reports on LANL participation in US and International Nuclear Data collaborations. (ND1)		
	Report planning status of LANL initiative focused on machine learning for nuclear data. (ND1)		
	Deliver nuclear data evaluations as indicated in Appendix B of this document. (ND1)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: Nuclear Data
DFGs (ND1), TSLs (ND2), Codes (ND3), Doppler (ND5), Cadmium (ND6)
M&O Contractor Name: Lawrence Livermore National Laboratory
Point of Contact Name: David Heinrichs
Point of Contact Phone: (925) 424-5679

Reference: B&R DP0909010
Date of Report: July 25, 2018

BUDGET



1. Carryover into FY-2018 = $55,705
2. Approved FY-2018 Budget = $463,705 (Includes carryover from FY-2017)
3. Actual Spending through the end of this quarter (in FY-2018) = $140,910 (not including the $45,459.40 overage on the previous contract)
4. Projected carryover into FY-2019 = $88,705 (19%)

MAJOR ACCOMPLISHMENTS

Delayed Fission Gammas (ND1)

- Paper in progress on DFG methodology and validation.

Thermal Scattering Laws (ND2)

- NCSU continued work on molecular dynamics (MD) models for light water. The TIP4P/2005f force field was reparametrized at 300 ºK and calculations of the thermal scattering cross sections were performed. The ratio of the calculated total cross section was calculated relative to that at 473 ºK and compared to experimental (EXFOR) data. The results showed improvement compared to results obtained using the latest ENDF/B-VIII.0 libraries. In addition, *ab initio* MD (AIMD) models of light water have been initiated to investigate using this methodology in TSL calculations.
- NCSU and LLNL attended the 2018 Nuclear Data WPEC meeting at the NEA in Paris, France. NCSU leads subgroup 42 (SG42) on TSL data. The group discussed the latest theoretical, computational and experimental developments related to TSL data. An SG42 report is currently being prepared. WPEC approved continuation of a TSL SG for another 3 year period.
- NCSU submitted an ANS summary entitled "Development of a First-Principles Hydrogen Vibrational Spectrum in Liquid H_2O" to the 2018 winter meeting.
- NCSU presented/published the paper entitled "Assessment of Thermal Neutron Scattering in A Heavy Paraffinic Molecular Material" at the PHYSOR 2018 meeting. The paper was invited by the meeting organizers to appear in a PHYSOR special issue of the journal Annals of Nuclear Energy.

Next Generation Codes (ND3)

- NCSU continued work on the *FLASSH* code. An update was completed that includes improved execution of the one-phonon correction to eliminate issues with using the total number of atoms as number of inequivalent atom sites, correction of error reporting if one-phonon or angular differential cross section evaluation is disabled, and appropriate reporting of computational status when elastic option is selected.
- NCSU presented/published the paper entitled "Full Law Analysis Scattering System Hub (*FLASSH*)" at the PHYSOR 2018 meeting describing *FLASSH* development.

Advanced Doppler Broadening (ND5)

- NCSU generated the Doppler broadened cross section for U in UO_2 using the TSL model at various temperatures. Investigation of benchmarks for this data is currently underway. Enhancement of this capability using the exact TSL (without cubic approximation) is being investigated.

	• NCSU was awarded a 'best paper' award at the NCSP TPR meeting. As a result, the summary "Impact of the Dynamic Structure Factor on Doppler Broadening for ^{238}U in UO_2" has been submitted to the ANS 2018 winter meeting. Radiative Capture Gamma Production in Cadmium (ND6) • The feasibility of performing an inexpensive direct gamma production measurement using a thermal beamline from the UC-Davis (McClellan) TRIGA reactor is being explored in collaboration with the LLNL Nuclear & Particle Physics Group. ^{233}U Fission Nu-Bar Measurement • Successfully performed a 10 day surrogate experiment measuring the ^{233}U (n,fxn) reaction including neutron multiplicity (and nu-bar) using the LLNL NeutronSTARS detector at Texas A&M University.

NCSP Quarterly Progress Report (FY-2018 Q3)

LLNL ND Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

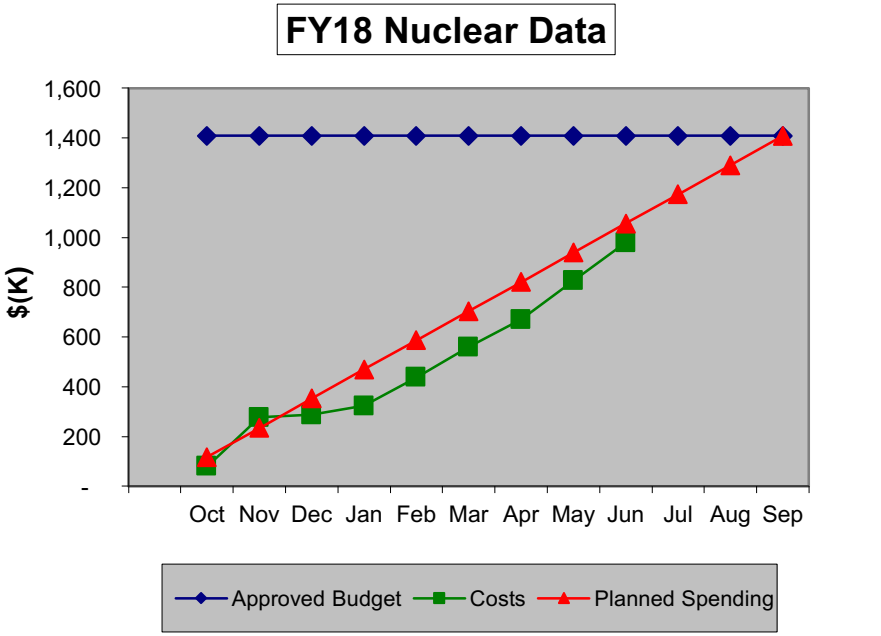
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide status on LLNL ND activities in NCSP Quarterly Progress Reports (ND1, ND2, ND3, ND5, ND6)		
	Provide status on LLNL/NCSU nuclear data activities to NCSP Manager. (ND2, ND3, ND5)		
	Provide status on LLNL/IRSN nuclear data activities to NCSP Manager. (ND1)		
Q2	Provide status on LLNL ND activities in NCSP Quarterly Progress Reports (ND1, ND2, ND3, ND5, ND6)		
	Provide status on LLNL/NCSU nuclear data activities to NCSP Manager. (ND2, ND3, ND5)		
	Provide status on LLNL/IRSN nuclear data activities to NCSP Manager. (ND1)		
Q3	Provide status on LLNL ND activities in NCSP Quarterly Progress Reports (ND1, ND2, ND3, ND5, ND6)		
	Provide status on LLNL/NCSU nuclear data activities to NCSP Manager. (ND2, ND3, ND5)		
	Provide status on LLNL/IRSN nuclear data activities to NCSP Manager. (ND1)		
Q4	Provide status on LLNL ND activities in NCSP Quarterly Progress Reports (ND1, ND2, ND3, ND5, ND6)		
	Provide status on LLNL/NCSU nuclear data activities to NCSP Manager. (ND2, ND3, ND5)		
	Provide status on LLNL/IRSN nuclear data activities to NCSP Manager. (ND1)		
	Deliver thermal neutron scattering data evaluations as indicated in Appendix B of the 5-Year Plan. (ND2)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: ORNL – ND1, 6, 7, 8
M&O Contractor Name: ORNL
Point of Contact Name: Doug Bowen
Point of Contact Phone: (865) 576-0315

Reference: DP0902000/ORNL
Date of Report: Month Day, 2018

BUDGET



1. **Carryover into FY 2018** = $41K
2. **Approved FY 2018 Budget** = $1,408K (includes carryover)
3. **Actual spending for 1st Quarter FY 2018** = $287K
4. **Actual spending for 2nd Quarter FY 2018** = $273K
5. **Actual spending for 3rd Quarter FY 2018** = $419K
6. **Actual spending for 4rd Quarter FY 2018** = $0

MAJOR ACCOMPLISHMENTS

ND1 – Evaluations and Measurements

- **Status report on all nuclear data support activities.**
  - Resonance region evaluation work on 156Gd, 158Gd, and 160Gd as indicated in Appendix B of the NCSP Five Year Plan and implied under the Milestone ORNL-ND1 is progressing well with analysis of the differential data. Dr. Leal of (IRSN) has been working in parallel on the resonance evaluation of 155Gd and 157Gd. A collaboration visit to synchronize the evaluations of the 5 isotopes has been completed in Q3 and a trip report has been submitted to the NCSP Manager. As one quantitative example of the collaboration visit was the Sobes and Leal by joint efforts, managed to reduce the chi-squared statistical metric of the fit of experimental capture data from RPI from a value of 5.2 to below 4.5.
  - Sobes (ORNL) and Leal (IRSN) have began the re-evaluation of the isotopes of lead as indicated in Appendix B. During this visit a comprehensive review of the current evaluations in ENDF/B-VIII.0 and JEFF3.3 was performed. The effort culminated in a summary to be submitted to the ANS Winter Meeting and Technology Expo.
  - The work on both the gadolinium and the lead is progressing according to plan and is expected to be completed in accordance with the timeline in Appendix B. One potential hurdle for the gadolinium work is the lack of trustworthy integral benchmark data as presented by BJ Marshal at the ANS Summer 2018 meeting. Paper also attached.
  - Participation in the first International Nuclear Data Evaluation Network (INDEN) meeting held in Vienna (https://www-nds.iaea.org/index-meeting-crp/CM-INDEN-2018/)
  - Work on presentation for INDEN I (ID 110811) focusing on proposed updates for fissile actinides in the resolved resonance region.
  - A draft of the IAEA summary report INDC(NDS)-0761, "INDEN I – On the resonance parameters of actinides" was provided.
  - Work on the journal paper for the n+16O is in still progress.
  - The work on the dysprosium evaluations is in still progress and the improvement in the simultaneous fit is performed among the measured data of both enriched and natural samples.
  - Work on the n+28,29,30Si cross section evaluations. Update of the thermal value for the capture cross section for the 28Si isotope. The val-

NCSP Element and Subtask: ORNL – ND1, 6, 7, 8 **M&O Contractor Name:** ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0902000/ORNL **Date of Report:** Month Day, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
	ue was adjusted following a recent study conducted at IAEA to assess the thermal capture cross sections for a large set of isotopes. The changes in the cross section were performed on both resonance parameters and the direct capture component that for light nuclei can be large. The validation results show improved agreement with ICSBEP benchmarks compared to ENDF/B-VIII.0. o Work on writing a letter report is in progress on the evaluation work on silicon isotopes. o Review of report on 233U evaluation was performed. o Work on creating the repository and preparatory (input and quantum number) files related to the set of cerium evaluations. o Discussion about direct capture cross (DC) section calculation for Silicon. The NCSP Si evaluation was published in 2001 but not included in the ENDF due to problems at that time to include the DC. Now ENDF and processing codes can handle DC in the data format and the evaluation is revisited with updated thermal values and tested (Pigni, Arbanas, Wiarda, Guber). o Assisting to prepare visit of A. Chamber and D. Bowen to JRC-Geel. • **Status report on all ORNL participation in US and International nuclear data collaborations and foreign travel.** • **Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5-year plan.** o Travel to JRC-Geel in April for continuation of the La experiments. o Rerun data sorting for calibration experiment for the thick Ce sample o Continued data reduction of the previously obtained neutron capture data for a thick Ce sample. Determination of the flux spectrum, including all corrections. Production of all TOF spectra for Ce sample corrections. Data reduction for the calibration measurement and obtained normalization factor for the thick Ce sample. o Path forward: continue experiments on La and obtain Ce-142 sample for experiments. o Paperwork for the C-142 sample was not approved in time for the trip to JRC-Geel to start experiments. Sample will be leased for the next trip in fall. o Enriched Zr and Ce-142 experiments delayed, due to problems obtaining samples for lease.

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: ORNL – ND1, 6, 7, 8 **M&O Contractor Name:** ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0902000/ORNL **Date of Report:** Month Day, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
	ND6 – SAMMY Modernization • **Status report on all SAMMY modernization progress** o The C++ Coulomb Functions Application Programming Interface (API) previously implemented in (Q2) was extended in (Q3) to provide the required Coulomb wave function solutions for neutral particles (in addition to charged particles). The CWF API is designed with a layered software architecture approach, so the top-level complexity of computing the Coulomb wave functions in the SAMMY source code is greatly reduced (improving readability) and long-term maintainability is ensured. The underlying solution methods used by the CWF API were improved to take advantage of well-known recursion relations to further reduce the complexity and computational cost of solving for the Coulomb wave functions. Further, the CWF API now caches the wave function solutions to reduce the number solves required when computing intimately related quantities (such as the penetrability, shift factor, and phase shift). o The SAMMY subroutine responsible for computing the R-Matrix was heavily modified to allow for the inclusion of closed-channel contributions to the R-Matrix when performing the resonance cross section evaluation without the B=S approximation. The inclusion of closed-channels was only possible thanks to the new Coulomb Wave Function API; without the new API, SAMMY did not have the capability to compute the necessary shift factors below the channel threshold to include the closed channels in the R-Matrix formulation. Use of the CWF API further reduced code complexity by eliminating the need for many if-else branches and charge-specific subroutine calls. As expected, these changes to the R-Matrix subroutine resulted in no change to the B=S test case results; the test cases that utilize B=/=S were examined for correctness and re-baselined as necessary. o To address long-term maintainability, all FORTRAN 77 “COMMON” blocks and “BLOCK DATA” have been completely eliminated from the SAMMY source code. These global data structures were reworked into modern FORTRAN module containers, which is a necessary first step in creating manageable libraries. This refactoring will also help to untangle some of the SAMMY inter-dependencies, as well as improve code clarity by allowing for explicit inclusion of individual variables as needed. o Based on user feedback, changed SAMMY PAR file to keep Reich-Moore fission

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: ORNL – ND1, 6, 7, 8 **M&O Contractor Name:** ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0902000/ORNL **Date of Report:** Month Day, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
	channel widths as zero if they were zero-valued in the ENDF file (specifically taken from the "LRF=3" format). SAMMY assumed all channels stay open once open (in a spin group), so it wrote a default value of 10^-7 eV for channel widths which were previously open but not given a width in ENDF. This only affects the intermediate SAMMY PAR file write for LRF=3 (LRF=1,2,7 unaffected). This change has virtually no impact on the fitted cross sections, but greatly improves consistency and clarity for the user. • **SAMMY modernization progress report (Q4)** o Work not yet started. **ND7 – Collaboration task with GA Tech** o Contract was set up with GA Tech to initiate work for 2018-2098 school year. This university task will fund an MS student. **ND8 – Nuclear Data Work Plan for U-233 for the NCSP (Due Q3)** • **Status report** o Finalized report on U-233 evaluated and experimental data assessment. Report was reviewed and published. **Y12 ND1 – GELINA depleted Uranium target cost estimate and construction** • **Status report** o Obtained detailed drawing of the GELINA neutron production target and provided them to the Y12 engineers. The drawings were obtained during the visit to JRC-Geel in April. Provided operations sequence for the Uranium rotating target construction.

NCSP Quarterly Progress Report (FY-2018 Q3)

ORNL ND Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND1, ND6, ND7).		
	Provide status reports on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1).		
	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B (ND1).		^{nat}La measurements performed. Lease processed for ^{142}Ce.
Q2	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND1, ND6, ND7).		
	Provide status reports on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1).		
	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B (ND1).		
Q3	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND1, ND6, ND7).		
	Provide status reports on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1).		
	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B (ND1).		Worked with NCSP manager to remedy the sample leasing process.
	Complete nuclear data work plan for ^{233}U and provide plan to NCSP Manager (ND8).		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND1, ND6, ND7).		

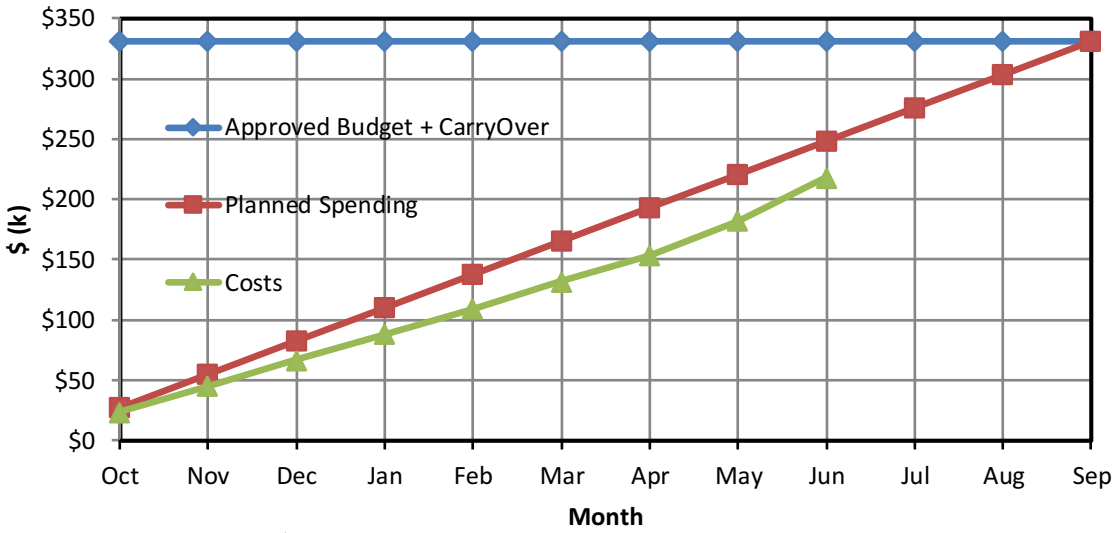
	Provide status reports on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1).		
	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B (ND1).		
	Document SAMMY modernization progress and report status annually to the NCSP Manager (ND6).		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: RPI-ND1- Resonance Region Nuclear Data Measurement Capability at RPI - Perform cross-section measurements and qualification of the new capabilities
M&O Contractor Name: RPI
Point of Contact Name: Yaron Danon
Point of Contact Phone: 518-276-4008

Reference: RPI ND-1
Date of Report: 7/19/2018

BUDGET



a) Carryover into FY-18: $-8,520
b) Approved FY-18 budget: $340,000, $331,480 (with carryover),
c) Actual spending through the end of this quarter in FY-18: $218,066
d) Projected carryover into FY-19: $10,000

MAJOR ACCOMPLISHMENTS

- Presented Ta transmission and yield results at 2018 ANS annual meeting in Philadelphia.
- Improved models for experimental neutron capture yield data in SAMMY

NCSP Quarterly Progress Report (FY-2018 Q3)

RPI ND1 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND1)		
	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest. (ND1)		
	Complete analysis of measurement from FY17. (ND1)		
Q2	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND1)		
	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest. (ND1)		
Q3	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND1)		
	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest. (ND1)		
	Complete transmission measurement per the nuclear data schedule in Appendix B. (ND1)		**Based on available data an additional Ta transmission measurement is planned for in Q4**
	Complete capture measurement per the nuclear data schedule in Appendix B. (ND1)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND1)		
	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on		

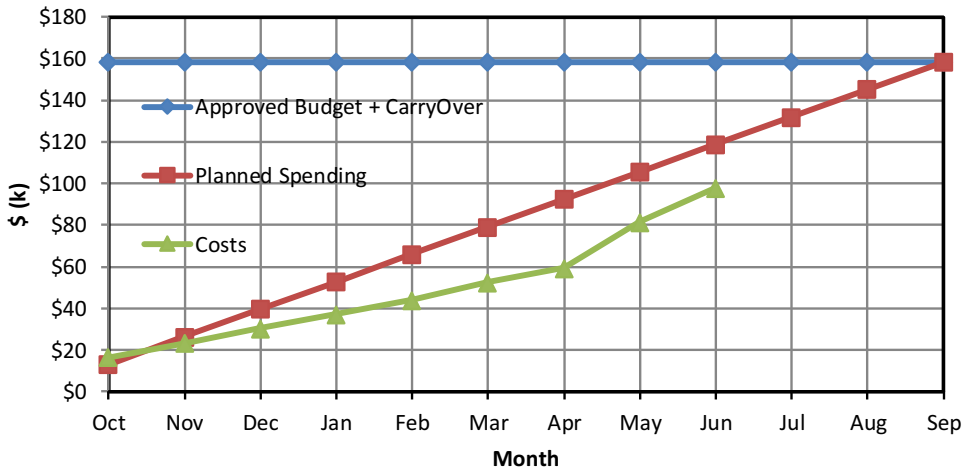
	items of NCSP interest. (ND1)		
	Complete data analysis for transmission and capture measurements and provide the data to ORNL as needed to support the evaluation effort per the nuclear data schedule in Appendix B. (ND1)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: RPI-ND2- Thermal neutron scattering measurements
M&O Contractor Name: RPI
Point of Contact Name: Yaron Danon
Point of Contact Phone: 518-276-4008

Reference: RPI ND-2
Date of Report: 7/19/2018

BUDGET



1. Carryover into FY-18: $32,481
2. Approved FY-18 budget: $126,000, $158,481 (with carryover)
3. Actual spending through the end of this quarter in FY-18: $97,850
4. Projected carryover into FY-19: $15,000

MAJOR ACCOMPLISHMENTS

- Polyethylene manuscript was published in Annals of Nuclear Energy. https://doi.org/10.1016/j.anucene.2018.06.029 .
- Submitted a paper to ANS Winter Meeting and Technology Expo 2018 titled: " Towards a better thermal neutron scattering law generation: oClimax + NJOY2016".
- Experimental double differential scattering cross section data ready to be submitted to EXFOR. This includes data for all measured materials and temperatures: H_2O, CH_2 (Both ARCS and SEQUOIA), Quartz, Lucite, Teflon, and Concrete.
- Prepared polyethylene, lucite, quartz and ice-1h ENDF libraries and input NJOY files for submission to ENDF.

NCSP Quarterly Progress Report (FY-2018 Q3)

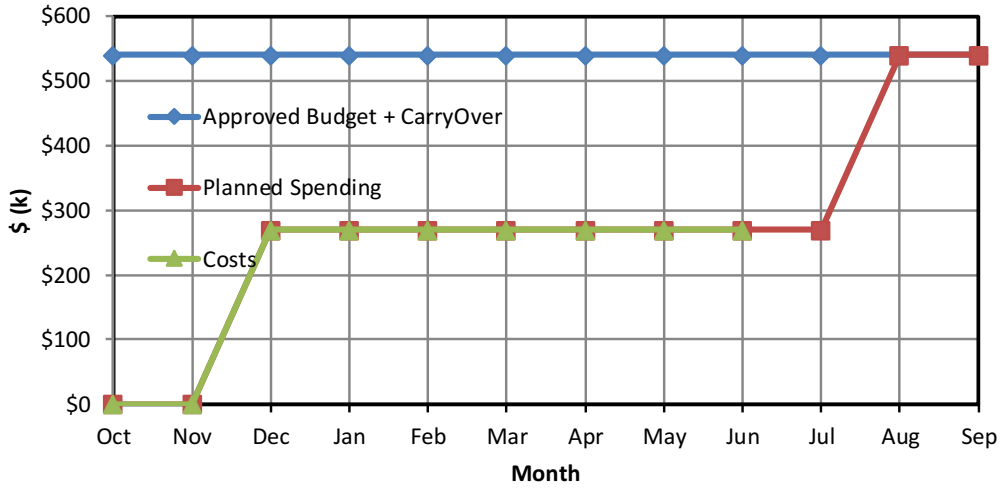
RPI ND2 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND2)		
Q2	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND2)		
Q3	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND2)		
	Complete thermal scattering measurements per the nuclear data schedule in Appendix B (these are repeat measurment if needed)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND2)		
	Complete thermal scattering data analysis and provide the data to ORNL as needed to support the evaluation effort per the nuclear data schedule in Appendix B. (ND2)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: RPI-ND3- LINAC 2020 plan, Nuclear Data Capabilities Maintenance plan **M&O Contractor Name**: RPI **Point of Contact Name**: Yaron Danon ***Point of Contact Phone***: 518-276-4008	Reference: RPI ND-3 Date of Report: 7/25/2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
 a) Carryover into FY-18: $0 b) Approved FY-18 budget: $540,000 c) Actual spending through the end of this quarter in FY-18: $270,000 d) Projected carryover into FY-19: $0	Factory acceptance test of new modulator 1 did not pass RPI criteria; it will be redone in Q4. LINAC sections/structures, final design report was accepted and signed-off on 6/15/18. Vendor is on schedule for delivery of the first two structures ~February 2019. First draft of the high-level portion of the control system document was completed.

NCSP Quarterly Progress Report (FY-2018 Q3)

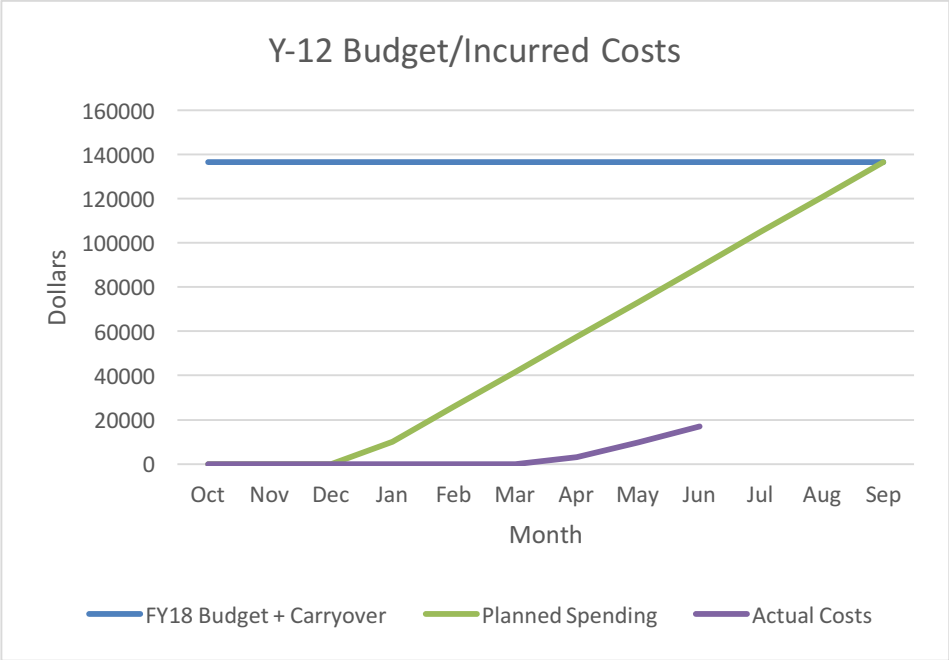
RPI ND3 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND3)		
	Place accelerator sections contract with vendor. (ND3)		
Q2	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND3)		
	Complete modulator factory test in coordination with NR. (ND3)		**Task performed, but test failed due to vendor lack of preparation. Will compete in Q4**
Q3	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND3)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports. (ND3)		
	Complete modulator(s) factory test in coordination with NR. (ND3)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: ND Y12- (Prepare Cost Estimate for GELINA Target) M&O Contractor Name: Y-12 Point of Contact Name: Kevin Kimball Point of Contact Phone: 865-576-6675	Reference: B&R DP 0902017 Date of Report: July 25, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
 a) Approved FY-2018 Budget = $136,432; CR To Date = $136,432 b) Actual Spending through the end of this quarter in FY-2018 = $16,950	• Fifteen Gelina drawings scanned into system. Received by Y-12 • Vendor selected for translating drawings into English and converting scans to CAD. Purchase order approved for work to be performed.

NCSP Quarterly Progress Report (FY-2018 Q3)

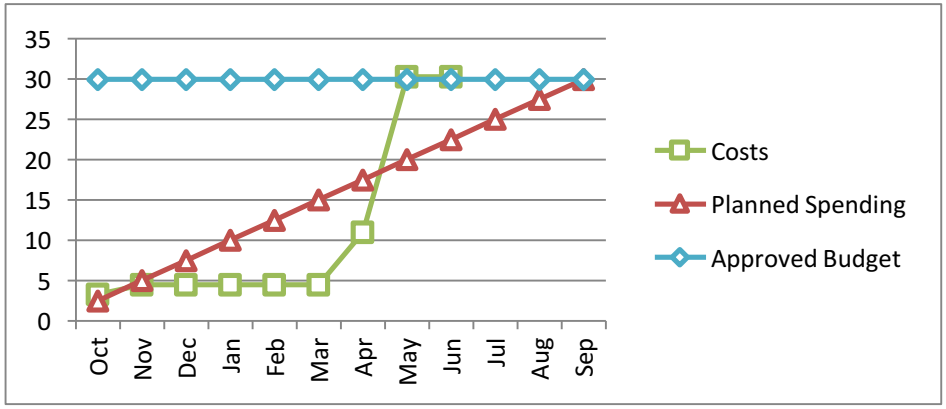
Y12 ND Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Obtain existing target drawings (Q1)		Complete
Q2	Review existing target drawings for completeness and request additional required information (Q2)		Complete
Q3	Meet with Y-12 production personnel and external suppliers to obtain estimated fabrication costs (Q3)		Drawings were received. Local manufacturer needs a set of CAD drawings in English to complete cost estimate. Vendor selected and approved for converting drawings. Slow procurement process has resulted in delays. Pursuing alternate means of generating estimate as a contingency to ensure we meet Q4 milestone.
Q4	Complete cost estimate for fabrication of GELINA(Q4)		On track

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: T&E4 (Training in Validation Techniques Using Modern S/U Tools) M&O Contractor Name: LANL Point of Contact Name: Bob Margevicius / Bob Little Point of Contact Phone: 505-665-8965 / 505-665-3487	Reference: B&R DP0902090 Date of Report: July 19, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
 1. Carryover into FY-2018 = $0. 2. Approved FY-2018 Budget = $29,000 (Includes carryover from FY-2017). 3. Actual Spending through the end of this quarter in FY-2018 = $30,265. 4. Projected carryover into FY 2019 = $0.	• **Completed Milestone** for FY2018: Joint with ORNL, provided 1-day validation training class at Savannah River Site, April 23, 2018. Fourteen NCS personnel attended.

NCSP Quarterly Progress Report (FY-2018 Q3)

LANL TE4 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

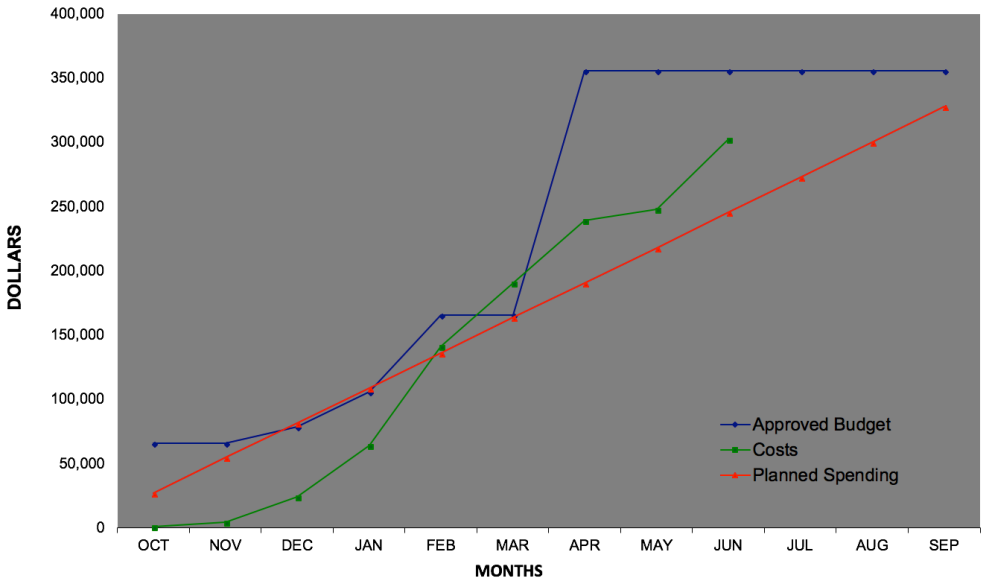
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q4	In collaboration with ORNL, provide introductory 1-day S/U workshop training to one or more DOE sites in FY2018.		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtasks: Training & Education,
"Hands-on" Training (TE1), Classroom Instruction (TE3), TACS with Be (TE8)
M&O Contractor Name: Lawrence Livermore National Laboratory
Point of Contact Name: David Heinrichs
Point of Contact Phone: (925) 424-5679

Reference: B&R DP0909010
Date of Report: July 25, 2018

BUDGET



- Carryover into FY-2018 = $0
- Approved FY-2018 Budget = $356,000 (Includes carryover from FY-2017)
- Actual Spending through the end of this quarter in FY-2018) = $302,823
- Projected carryover into FY-2018 = $28,000 (8%)

MAJOR ACCOMPLISHMENTS

"Hands-on" Training (TE1) and Classroom Instruction (TE3)

- Provided registration and logistics support for:
  - 1-week Managers course on April 15-20, 2018 at SNL
  - 1-week Managers course on June 11-15, 2018 at NFO/NCERC
  - 2-week CSE course on Aug 13-24, 2018 at NATM & NCERC/SNL
  - 2-week CSE course on Jan 28-Feb 8, 2019 at NATM & NCERC/SNL
  - 1 week Managers course on April 15-19, 2019
- Provided academic and hands-on instruction for the one-week Managers course at NFO/NCERC on June 11-15, 2018 including the following modules:
  - NCS Fundamentals
  - Introduction to Experimental Methods
  - TACS
- Transferred new ^{241}Am-Be and ^{252}Cf sources to LLNL custody in the DAF.
- Participated in the T&E Mission & Vision review and telecon.
- Participated in all T&E teleconferences

TACS with Beryllium (TE8)

- Transferred the first of three shipments of beryllium shells to LLNL custody at NNSS.

NCSP Quarterly Progress Report (FY-2018 Q3)

LLNL T&E Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

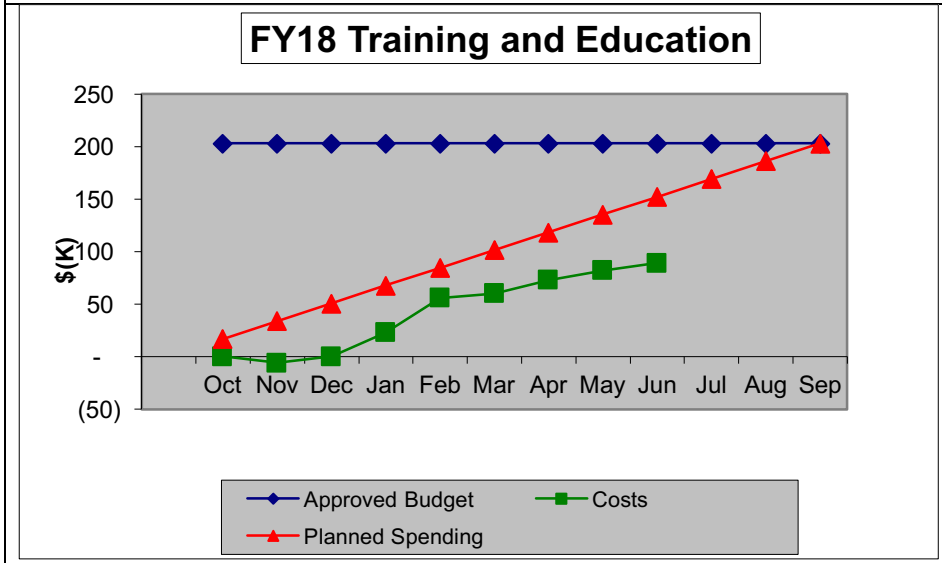
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Update, maintain and support the registration process and provide classroom and "hands on" TACS training in accordance with the schedule approved by the NCSP Manager. (TE1)		
	Provide LLNL support for FY2018 classroom instruction at the Nevada Site Facility or National Atomic Testing Museum and participation in T&E development activities in accordance with the schedule approved by the NCSP Manager. (TE3)		
Q2	Update, maintain and support the registration process and provide classroom and "hands on" TACS training in accordance with the schedule approved by the NCSP Manager. (TE1)		
	Provide LLNL support for FY2018 classroom instruction at the Nevada Site Facility or National Atomic Testing Museum and participation in T&E development activities in accordance with the schedule approved by the NCSP Manager. (TE3)		
Q3	Update, maintain and support the registration process and provide classroom and "hands on" TACS training in accordance with the schedule approved by the NCSP Manager. (TE1)		
	Provide LLNL support for FY2018 classroom instruction at the Nevada Site Facility or National Atomic Testing Museum and participation in T&E development activities in accordance with the schedule approved by the NCSP Manager. (TE3)		
Q4	Update, maintain and support the registration process and provide classroom and "hands on" TACS training in accordance with the schedule approved by the NCSP Manager. (TE1)		
	Provide LLNL support for FY2018 classroom instruction at the Nevada Site Facility or National Atomic Testing Museum and participation in T&E development activities in accordance with the schedule approved by the NCSP Manager. (TE3)		
	Evaluate the TACS with Be shells and provide a status report in the FY2018 Q4 quarterly status report to the NCSP Manager. (TE8)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: TE1 and TE5
M&O Contractor Name: ORNL
Point of Contact Name: Doug Bowen
Point of Contact Phone: (865) 576-0315

Reference: DP0902000/ORNL
Date of Report: July 25, 2018

BUDGET



1. **Carryover into FY 2017** = $0K
2. **Approved FY 2017 Budget** = $203K (includes carryover)
3. **Actual spending for 1st Quarter FY 2018 = $0K**
4. **Actual spending for 2nd Quarter FY 2018 = $60K**
5. **Actual spending for 3rd Quarter FY 2018 = $29K**
6. **Actual spending for 4th Quarter FY2018 = $0K**
7. **Projected Carryover into FY 2018** = $0K

MAJOR ACCOMPLISHMENTS

- **TE1**
  - Drafted the final report on the CSSG assessment (CSSG tasking 2016-01) to document the resolution of all comments. In ORNL internal review.
  - Coordinated and executed the 1-week Manager course at NCERC Jun. 16-20, 2018 at the Sandia National Laboratory. Sandia staff, Bowen and Hicks supported the course as instructors. Becka Hudson provided administrative support for the course. This course had a significant contingent of UK students per our NCSP/AWE collaboration agreement in App. F of the 5year plan.
  - Coordinated and executed the 1-week Manager course at the NCERC. NCERC staff, Catherine Percher (LLNL), Doug Bowen, and Ellen Saylor supported the course as instructors. Becka Hudson provided administrative support for the course held June 11-15, 2018.
  - Worked to coordinate course material changes to support the simplification of the validation module to address instructor and student comments and concerns. This module is being integrated into the NCS evaluation workshops.
  - Assisted the CSSG draft a tasking for the proposed CSO course to be developed in FY2019.
- **TE5**
  - Marshall (ORNL) worked with Brown (LANL) to coordinate and execute for a 1-day S/U introductory training course at SRNS on April 23, 2018. This is a collaborative task with LANL (Brown, Alwin, Rising). B.J. Marshall, A. Holcomb, and C. Perfetti provided ORNL support. Additional course opportunities are being explored.

NCSP Quarterly Progress Report (FY-2018 Q3)

ORNL TE Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report in NCSP Quarterly Progress Reports on implementation of the NCS training program and resolution of CSSG comments from CSSG tasking 2016-01. (TE1)		
	Provide status reports in NCSP Quarterly Progress Reports on improvements/modifications to baseline NCS course training materials based on CSSG assessment report 2016-01, self-evaluation, and feedback from reviewers, observers, trainers, and the NCSP manager. (TE1)		
	Provide a status report in NCSP Quarterly Progress Reports on the progress of 1-day onsite introductory validation training conducted at one or more DOE sites. (TE5)		
Q2	Provide a status report in NCSP Quarterly Progress Reports on implementation of the NCS training program and resolution of CSSG comments from CSSG tasking 2016-01. (TE1)		
	Provide status reports in NCSP Quarterly Progress Reports on improvements/modifications to baseline NCS course training materials based on CSSG assessment report 2016-01, self-evaluation, and feedback from reviewers, observers, trainers, and the NCSP manager. (TE1)		
	Provide a status report in NCSP Quarterly Progress Reports on the progress of 1-day onsite introductory validation training conducted at one or more DOE sites. (TE5)		
Q3	Provide a status report in NCSP Quarterly Progress Reports on implementation of the NCS training program and resolution of CSSG comments from CSSG tasking 2016-01.		

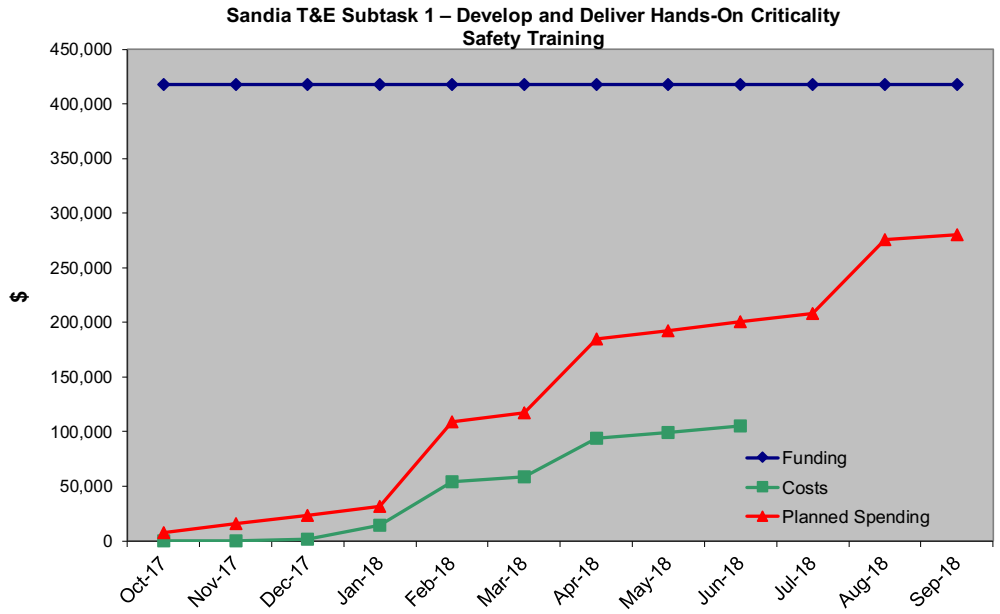
	(TE1)		
	Provide status reports in NCSP Quarterly Progress Reports on improvements/modifications to baseline NCS course training materials based on CSSG assessment report 2016-01, self-evaluation, and feedback from reviewers, observers, trainers, and the NCSP manager. (TE1)		
	Provide a status report in NCSP Quarterly Progress Reports on the progress of 1-day onsite introductory validation training conducted at one or more DOE sites. (TE5)		
Q4	Provide a status report in NCSP Quarterly Progress Reports on implementation of the NCS training program and resolution of CSSG comments from CSSG tasking 2016-01. (TE1)		
	Provide status reports in NCSP Quarterly Progress Reports on improvements/modifications to baseline NCS course training materials based on CSSG assessment report 2016-01, self-evaluation, and feedback from reviewers, observers, trainers, and the NCSP manager. (TE1)		
	Provide a status report in NCSP Quarterly Progress Reports on the progress of 1-day onsite introductory validation training conducted at one or more DOE sites. (TE5)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element: Sandia T&E Task 1 – Conduct Criticality Safety Training Classes
M&O Contractor Name: Sandia National Laboratories (SNL)
Point of Contact Name: Gary A. Harms
Point of Contact Phone: (505)845-3244

Reference: B&R DP 0909010
Date of Report: June 30, 2018

BUDGET



a) Carryover from the Previous FY = $309,801
b) Total Funding Available This FY: $107,968 (new) + $309,801 (carryover) = $417,769
c) Approved Current FY Budget = $280,000
d) Costs at the End of the Quarter = $104,968
e) Carryover into the Next FY = $0

MAJOR ACCOMPLISHMENTS

We completed delivery of a Hands-On criticality safety course for managers in April 2018.

We supported the delivery at NCERC of a Hands-On criticality safety course for managers in June 2018.

At the end of the quarter we were preparing for August delivery of a Hands-On criticality safety course for NCSEs.

NCSP Quarterly Progress Report (FY-2018 Q3)

SNL T&E Milestones:

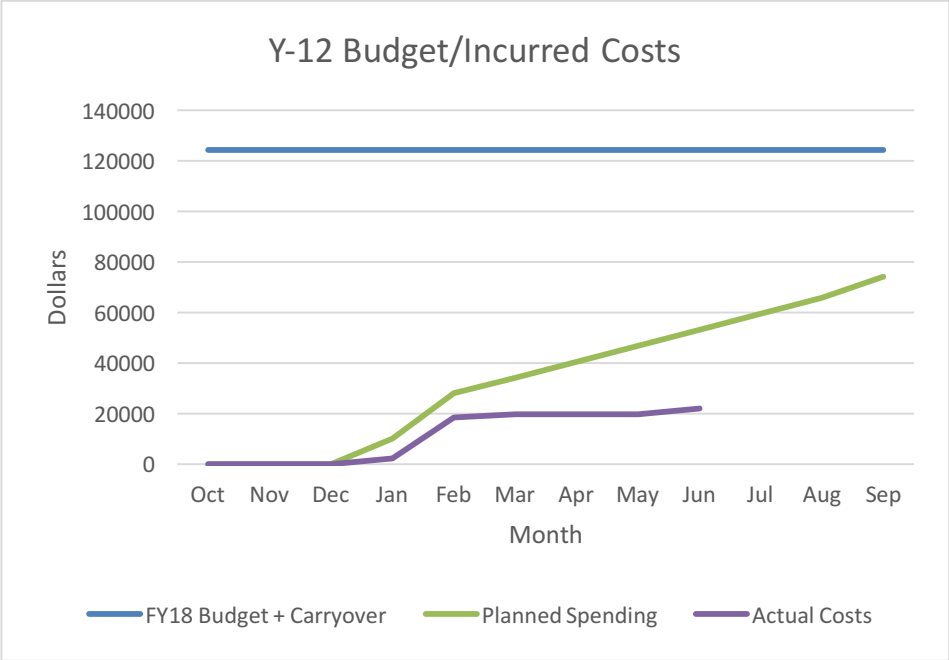
STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module support to the to the NCSP training courses in accordance with the approved schedule. (TE1)		
	Provide a status report to the NCSP Manager on the resolution of Sandia course materials and resolutions to CSSG comments provided in the CSSG 2016-01 tasking report. (TE1)		
Q2	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module support to the to the NCSP training courses in accordance with the approved schedule. (TE1)		
	Provide a status report to the NCSP Manager on the resolution of Sandia course materials and resolutions to CSSG comments provided in the CSSG 2016-01 tasking report. (TE1)		
Q3	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module support to the to the NCSP training courses in accordance with the approved schedule. (TE1)		
	Provide a status report to the NCSP Manager on the resolution of Sandia course materials and resolutions to CSSG comments provided in the CSSG 2016-01 tasking report. (TE1)		
Q4	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module support to the to the NCSP training courses in accordance with the approved schedule. (TE1)		

	Provide a status report to the NCSP Manager on the resolution of Sandia course materials and resolutions to CSSG comments provided in the CSSG 2016-01 tasking report. (TE1)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: Y12-T&E1 (Conduct Hands-On Criticality Safety Training Course) M&O Contractor Name: Y-12 Point of Contact Name: Kevin Kimball Point of Contact Phone: 865-576-6675	Reference: B&R DP 0902017 Date of Report: July 24, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
 a) Approved FY-2018 Budget = $124,273; CR To Date = $124,273 b) Actual Spending through the end of this quarter in FY-2018 = $19,606	• Taught Hand Calculations and the CSE Workshop in January's course and collected feedback on the hand calculation material

NCSP Quarterly Progress Report (FY-2018 Q3)

Y12 TE Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

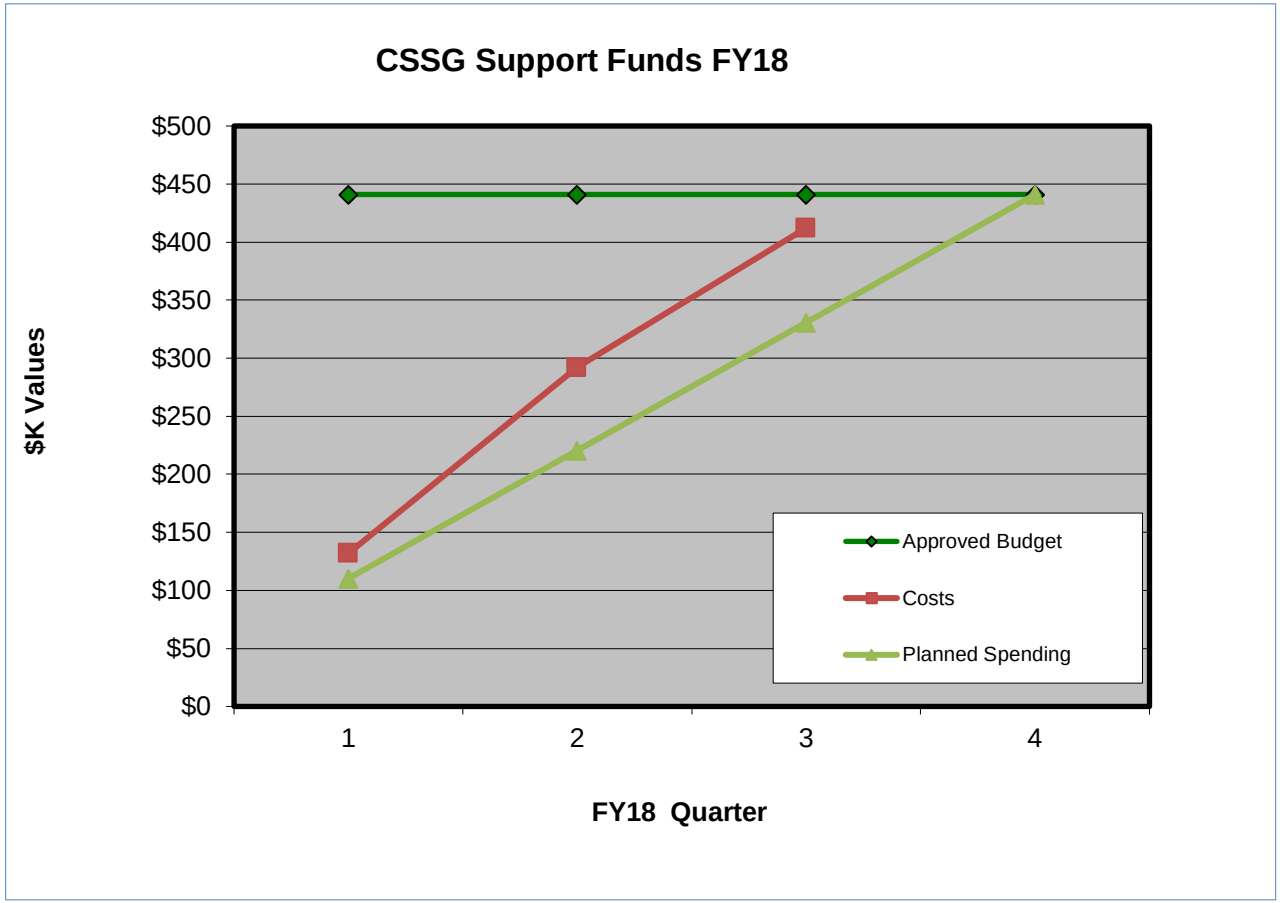
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Teach hand calculations and the CSE workshop in the course held in Las Vegas January 29th through February 2nd. (TE1)		
Q2	Revise hand calculation material per feedback received in last course. (TE2)		On track and will be ready for August's course.
Q3	Develop new LEU CSE for workshop (TE3)		Initial work has begun on developing the CSE but the CSE will not be ready for August's class. Revised goal is to have the new CSE ready for the class in January 2019.
Q4	Teach hand calculations and the CSE workshop in August's course. (TE4)		On track

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: CSSG Support
M&O Contractor Name(s): AECOM, ANL, LANL, LLNL, PNNL, SRNS, Y-12
Point of Contact Name: David Hayes (CSSG Deputy Chair)
Point of Contact Phone: 505-667-4523

Reference: B&R DP 0902010
Date of Report: July 25, 2018

BUDGET



a) Total Budget for FY18 = $441K
b) Actual Total Spending for FY18 = $412K
Q1 = $132K, Q2 = $155K, Q3 = $120K, Q4 = $0K

MAJOR ACCOMPLISHMENTS

- CSSG Chair/Deputy duties
- CSSG conference calls
- Face-to-Face meeting @ Philadelphia ANS
- Prepare/Review taskings/responses (2018-01)

NCSP Quarterly Progress Report (FY-2018 Q3)

CSSG TS Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

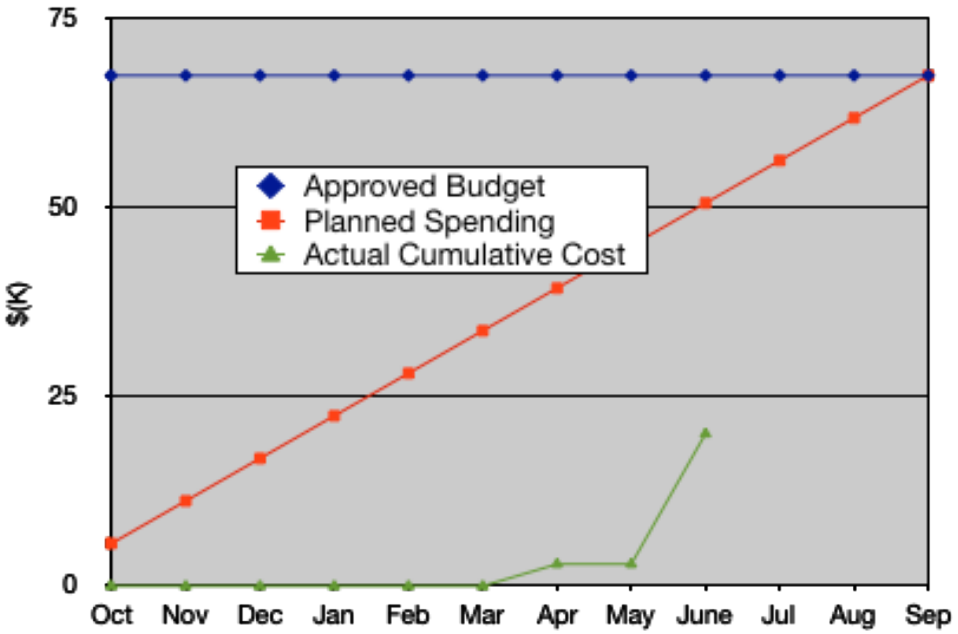
Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Provide the NCSP manager with a summary of CSSG activities, meetings, and tasks. (TS1)		
Q2	Provide the NCSP manager with a summary of CSSG activities, meetings, and tasks. (TS1)		
Q3	Provide the NCSP manager with a summary of CSSG activities, meetings, and tasks. (TS1)		**Issue Tasking 2018-01 and execute** **Expenditure, but no billing for EFT in Q3. Burn rate high as mentioned in Q2. Overages to be covered by Site Funding.**
Q4	Provide the NCSP manager with a summary of CSSG activities, meetings, and tasks. (TS1)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: NCSP Technical Support Task 6 M&O Contractor Name: BNL Point of Contact Name: David Brown Point of Contact Phone: 631-344-2814	Reference: B&R DP 0902090 Date of Report: July 25, 2018

BUDGET



1. Carryover into FY-2018 = $0
2. Approved FY-2018 Budget = $67,566 (Includes carryover from FY-2017)
3. Actual Spending through the end of this quarter in FY-2018 = $20,153

ACCOMPLISHMENTS

Work on task has only really started in June, but already several software tools are written and tested:

- a stochastic resonance generator (mcres.py)
- tools to extract average widths and spacings from RRR (built into inter.py, last year's TS1 product)
- related Office of Science project gave us a tool to compute average widths self-consistently from Hauser-Feshbach re-action code output (built into FUDGE)

NCSP Quarterly Progress Report (FY-2018 Q3)

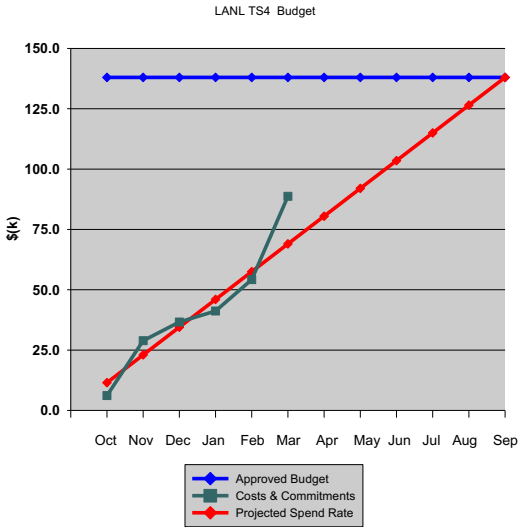
BNL TS6 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q4	Provide NCSP Manager annual report of succession planning efforts.		**Summer student has arrived and work has begun in earnest. We now are building tools to assess number of missing resonances. Once those are tested, we will apply them to 54Fe and use mcres.py to "backfill" missing resonances.**

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element: Integral Experiments LANL TS 4 **M&O Contractor Name:** Los Alamos National Laboratory (LANL) **Point of Contact Name:** Robert Margevicius **Point of Contact Phone:** (505) 665-8965	Reference: B&R DP0902090 Date of Report: July 25, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**
 **Carryover from last FY-17: $0.** **Total available funding this FY-18: $138.0K** **Total spending through the end of the report quarter Q3: $122.2K** **Carryover into new FY-19: $0.**	• George McKenzie successfully defended his PhD dissertation entitled "Area of Application for Relating Reactivity to Rossi-Alpha". He completed all the requirements to earn his PhD in Nuclear Engineering from the University of Illinois. • A summary of this work was presented at the Physor2018 conference held in Cancun, Mexico.

NCSP Quarterly Progress Report (FY-2018 Q3)

LANL TS4 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

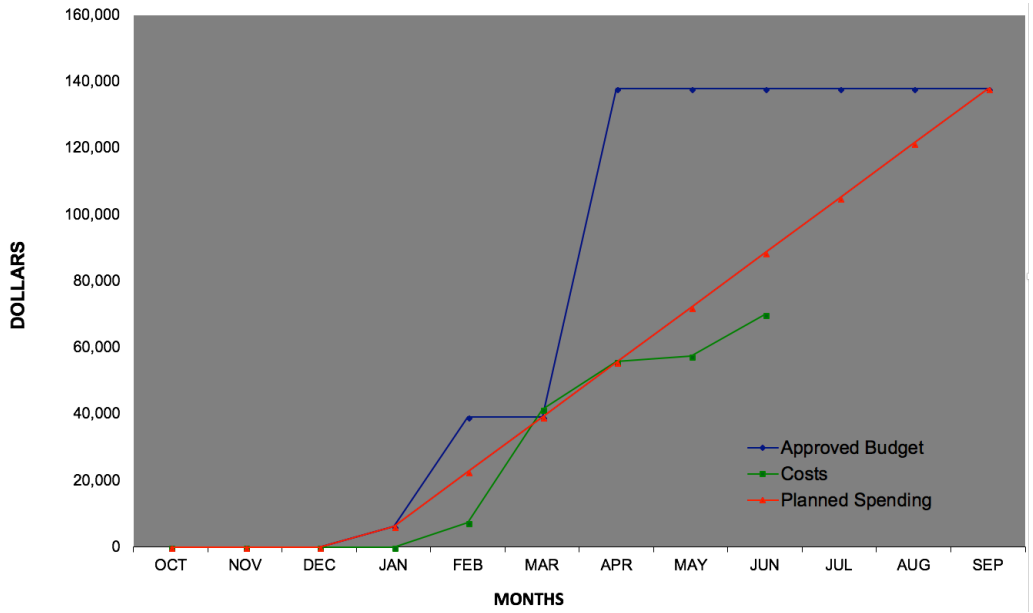
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q4	Provide NCSP Manager annual report of succession planning efforts.		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtasks: Technical Support
LLNL Succession Planning (TS5)
M&O Contractor Name: Lawrence Livermore National Laboratory
Point of Contact Name: David Heinrichs
Point of Contact Phone: (925) 424-5679

Reference: B&R DP0909010
Date of Report: January 25, 2018

BUDGET



1. Carryover into FY-2018 = $0
2. Approved FY-2018 Budget = $138,000 (Includes carryover from FY-2017)
3. Actual Spending through the end of this quarter (in FY-2018) = $69,974
4. Projected carryover into FY-2019 = $0 (0%)

MAJOR ACCOMPLISHMENTS

Analytical Methods

- Under Phil Kerr's tutelage, Tony Nelson is using the LLNL software 'BigFit' to perform Feynman-Y moments analysis of the measured and simulated count distributions for the **IER-407** [ISSA] ICSBEP evaluation.

Integral Experiments

- Will Zywiec submitted "Computational Optimization of Critical Experiment Designs" to the NCSP Special Session at the ANS Winter Meeting in Orlando, Florida.
- Jesse Norris accepted an offer of employment at LLNL and will join the Nuclear Criticality Safety Division on July 22, 2018.
- Shauntay Coleman attended "Fundamentals of Reactor Kinetics and Theory of Small Space-Time Dependent Fluctuations in Nuclear Reactors" at Chalmers University of Technology on June 18-21, 2018. The foreign travel report is in preparation.
- Catherine Percher presented "Comparison of Experimental and Predicted Temperature Results for TEX" at the PHYSOR 2018 conference in Cancun Mexico on April 22-26, 2018.
- Catherine Percher attended the 30th meeting of the Working Party on International Nuclear Data Evaluation Co-operation (WPEC) at NEA Headquarters on May 14-18, 2019. The foreign travel report is in preparation.
- Doug McAvoy transitioning NMO Project Lead and Responsible Individual responsibilities to Paul Yap-Chiongco in support of IE (NAD Lab, RadChem Lab).

Training and Education

- Tony Nelson and Will Zywiec supported Catherine Percher in teaching the hands-on (TACS) training portion of the 1-week Managers course on June 12, 2018.
- Doug McAvoy transitioning NMO Project Lead and Responsible Individual responsibilities to Paul Yap-Chiongco in support of T&E (TACS).

NCSP Quarterly Progress Report (FY-2018 Q3)

LLNL TS5 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone
			

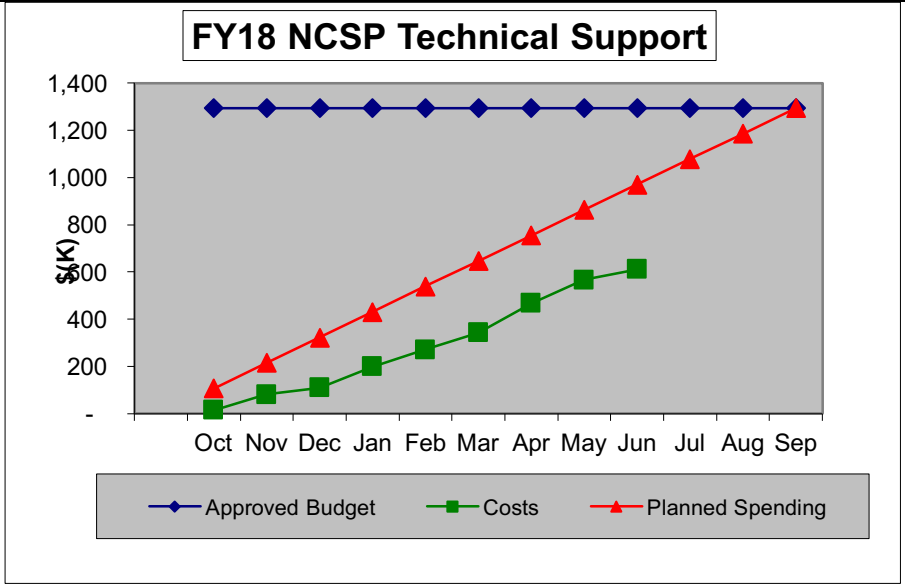
QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q4	Provide NCSP Manager annual report of succession planning efforts.		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: TS2 (NCSP Technical Support), TS7 (Succession Planning), TS8 (NCSP MGT Tool Prototype), TS11 (CEdT Manage Support)
M&O Contractor Name: ORNL
Point of Contact Name: Doug Bowen
Point of Contact Phone: (865) 576-0315

Reference: DP0902000/ORNL
Date of Report: July 25, 2018

BUDGET



1. **Carryover into FY 2018** = $5K
2. **Approved FY 2017 Budget** = $1,294K (includes carryover)
3. **Actual spending for 1st quarter FY 2017** = $110K
4. **Actual spending for 2nd quarter FY 2017** = $233
5. **Actual spending for 3rd quarter FY 2017** = $268
6. **Projected carryover into FY 2018** = $0

MAJOR ACCOMPLISHMENTS

NCSP TS2 Program MGT and Execution of the NCSP

- Prepare and maintain elements of NCSP Plan and associated activities:
  - Monitor Five-Year Plan progress,
  - Review/revise task list, and
  - Schedule/participate in meetings and teleconferences.
  - Manage and provide oversight/coordinate efforts for the NCSP Information, Preservation, and Dissemination task element.
  - Manage and provide oversight/coordinate efforts for the NCSP Training and Education Program task element.
- Participated in weekly NCSP management team and other NCSP-related meetings, as required by the NCSP Manager.
- Bowen and Miller continued efforts to work with Tim Wynn (ORNL) and Ty Deschamp (NA-50) about tracking IERs in the G2 system. A rudimentary system should be developed by the end of CY2018. Working with LLNL to decommission the LLNL IER database.
- Prepared Q2 QPRs into a single bookmarked PDF file for use in QPR. Conducted Q2 telecon.
- Issued the spring NCSP newsletter.
- Completed efforts to turn over CedT tasks from Doug Bowen to Thomas Miller.
- All BCRs for FY18 have been processed by CEdT Manager and a final IER status report was sent to the NCSP manager in June. Working with NCSP manager on approving IER reports as they are completed by the IER teams.
- Worked with Mission and Vision team leads to complete their draft Mission and Vision sections.
- Initiated main and IE 5-year plans for FY19. Started work on generating the pre-decisional budget spreadsheet. Sent out University and General call for proposals to all sites. Organized proposals for the NCSP manager and the CSSG. CSSG completed a pre-screen of all university and general proposals.
- Participated in CSSG telecons and assisted with CSSG tasks as necessary. Attended the CSSG meeting at the ANS Annual meeting in Philadelphia, PA.
- Began efforts to improve documentation of NCSP accomplishments to ensure NCSP work is linked to final 5YP milestones. Lori Scott in the process of creating new quarterly reporting templates to distribute to the site task managers.

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element and Subtask: TS2 (NCSP Technical Support), TS7 (Succession Planning), TS8 (NCSP MGT Tool Prototype), TS11 (CEdT Manage Support) **M&O Contractor Name:** ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0902000/ORNL **Date of Report:** July 25, 2018
	NCSP TS7 Succession Planning • New ORNL Post Doc (Christopher Chapman) and new ORNL staff member (Andrew Holcomb) working on Nuclear Data (SAMMY/AMPX) tasks with the nuclear data team leader and staff. In Q1, Chris Chapman began to work on nuclear data evaluations with Vlad Sobes as a mentor. Hosted Jesse Brown from RPI to work with the Nuclear Data team on SAMMY modernization tasks. • ORNL junior R&D staff (Vlad Sobes) working with Luiz Leal on NCSP ND evaluation work. **NCSP TS8 NCSP MGT Tool** • Continued work on an initial prototype of a new NCSP Program Management Tool began in FY17Q3. Prototype system planning for incorporating the IER process in the NNSA G2 accounting system initiated in FY18Q1 for the IER process. Further work is pending for the NCSP 5YP project management tools, although new needs have been identified. Metrics capability will not be part of the prototype. Scope of the project is in development. Miller is leading this effort as CedT Manager. A rudimentary system is expected sometime near the end of CY2018.

NCSP Quarterly Progress Report (FY-2018 Q3)

ORNL TS Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

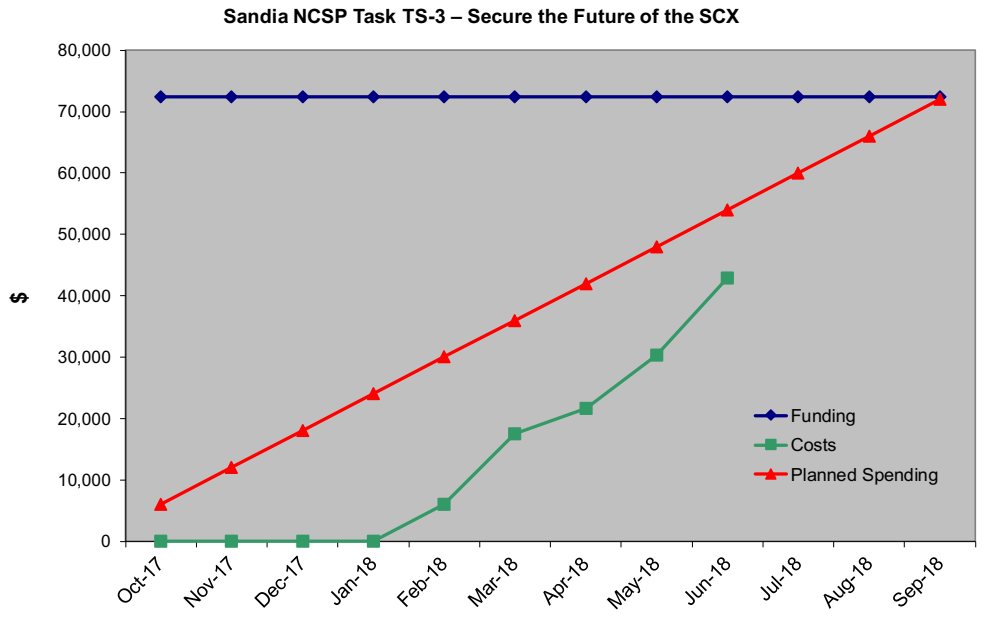
Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q1	Manage C_EdT process and coordinate execution of planned IERs each FY. (TS2)		
	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting and through the final task prioritization effort by the NCSP Management Team. (TS2)		
	Provide the NCSP manager with a summary of NCSP IE task TS11 as described in the task description. (TS11)		
Q2	Manage C_EdT process and coordinate execution of planned IERs each FY. (TS2)		
	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting and through the final task prioritization effort by the NCSP Management Team. (TS2)		
	Provide the NCSP manager with a summary of NCSP IE task TS11 as described in the task description. (TS11)		
Q3	Manage C_EdT process and coordinate execution of planned IERs each FY. (TS2)		
	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting and through the final task prioritization effort by the NCSP Management Team. (TS2)		
	Provide the NCSP manager with a summary of NCSP IE task TS11 as described in the task description. (TS11)		
Q4	Manage C_EdT process and coordinate execution of planned IERs each FY. (TS2)		
	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting		

	and through the final task prioritization effort by the NCSP Management Team. (TS2)		
	Participate in Q4 Budget Execution Meeting and assist NCSP Manager in finalization of approved tasks for next FY. (TS2)		
	Publish final Five Year Plan. (TS2)		
	Provide NCSP Manager a status report of progress on the development of a program management tool. (TS8)		Miller is leading this effort as CedT Manager. A rudimentary system is expected sometime near the end of CY2018. The IER database will be decommissioned in FY2018 Q4 once the G2 upgrades are sufficiently mature.
	Provide the NCSP manager with a summary of NCSP IE task TS11 as described in the task description. (TS11)		

NCSP Quarterly Progress Report (FY-2018 Q3)

NCSP Element: Sandia TS3 – Secure the Future of the SCX M&O Contractor Name: Sandia National Laboratories (SNL) Point of Contact Name: Gary A. Harms Point of Contact Phone: (505)845-3244	Reference: B&R DP 0909010 Date of Report: June 30, 2018
BUDGET	**MAJOR ACCOMPLISHMENTS**



1. Carryover from the Previous FY = $1,695
2. Total Funding Available This FY: $70,670 (new) + $1,695 (carryover) = $72,365
3. Approved Current FY Budget = $72,000
4. Costs at the End of the Quarter = $42,933
5. Carryover into the Next FY = $0

- We have a matrixed employee who is being trained as an experimenter.
- The new experimenter is documenting the IER-451 experiments.

NCSP Quarterly Progress Report (FY-2018 Q3)

SNL TS3 Milestones:

STATUS (copy color code and paste below in 'STATUS' field)

Complete	On Schedule	Behind Schedule	Missed Milestone

QUARTER	MILESTONE	STATUS	ISSUES/PATH FORWARD
Q4	Provide NCSP Manager annual report of succession planning efforts.		

2018-07-19

Summary of MCNP Criticality Classes in FY 2018

F.B. Brown, M.E. Rising, J.L. Alwin
Monte Carlo Methods, Codes, & Applications Group (XCP-3), LANL

FY2018 – Q3 classes are highlighted in red.

Classes sponsored by DOE-NNSA-NCSP (LANL-AM1)

- **Sensitivity-Uncertainty Tools & Practices for NCS Validation**
  - Apr 23, 2018, Savannah River, 14 students

  This is a joint effort between LANL & ORNL, covering background material and specific usage of MCNP6-Whisper and SCALE-KENO-TSUNAMI-TSURFER. D. Bowen coordinates scheduling at DOE sites.

- **Criticality Calculations with MCNP6**
  - Feb 26 – Mar 2, 2018, LANL, 4 students
  - June 11-14, 2018, Y-12, 25 students
  - Aug 6-10, 2018, LANL,

  MCNP criticality class for NCS & reactor physics practitioners, with focus on best practices. Includes 1 day on NCS validation using MCNP6-Whisper.

  For classes at LANL, NCSP-sponsored students do not pay registration fees. For classes at other DOE sites, there are no registration fees.

- **Monte Carlo Techniques for Nuclear Systems**
  - Aug 25 – Dec 8, 2017, UNM, 18 students

  This is a 1-semester class for senior undergrads & graduate students at the University of New Mexico. Required for UNM graduation in Nuclear Engineering. Includes Monte Carlo theory & practical use of MCNP6. 2 of the students were part of the LANL NCS intern program. (This teaching is partially supported by NCSP, ASC, and other programs.)

- **Advanced Computational Methods for Monte Carlo Calculations**
  - Jan 17–May 9, 2018, UNM & LANL 8 students UNM, 12 students LANL

  This is an advanced class covering details of transport theory, Monte Carlo, advanced computing methods, and code development. Material from this course is also used to teach LANL staff members. (This teaching is partially supported by NCSP, ASC, and other programs.)

Other Classes (LANL-AM1)

- **Introduction to MCNP6**
  - Dec 4-8, 2017, LANL, 15 students
  - Dec 11-15, 2017, NCSU 30 students
  - Jan 8-12, 2018, LANL 15 students
  - Apr 2-6, 2018, LANL, 15 students
  - June 4-8, 2018, LANL, 14 students
  - June 11-15, 2018, LANL, 12 students
  - Aug 13-17, 2018, LANL,

  Standard introductory class, includes 1/2 day on criticality calculations. Classes at LANL are supported by student registration fees.

Summary of NJOY Classes in FY 2018

J.L. Conlin and W. Haeck
Materials and Physical Data Group (XCP-5), LANL

FY2018 – Q3 classes are highlighted in red.

- **Using NJOY to Create MCNP ACE Files and Visualize Nuclear Data**
  - Apr 10-12, 2018, Los Alamos, 7 students

  This 3-day introductory class introduces participants to the United States Evaluated Nuclear Data File (ENDF) format and the NJOY Nuclear Data Processing System. The current version of the NJOY code, NJOY2016, is pre-installed on classroom computers. Interactive exercises allow class participants to gain experience using NJOY on practical problems.

- **NJOY Workshop at PHYSOR 2018**
  - April 22, 2018, PHYSOR, Cancun 20 attendees

  This 4-hour workshop was intended to provide an overview of the status and capabilities of NJOY 2016 and NJOY21.

2018 Q3 – SCALE Training Courses Report for the Nuclear Criticality Safety Program

Class Name	SCALE 6.2 Criticality Safety Traing Course: KENO-VI Monte Carlo Code
Class Dates	4/5/18
Location	University of Florida, Gainesville, FL
Number of Attendees	16
Short Description	A short (4-hour) introductory course covering the fundamentals of the KENO-VI Monte Carlo code for criticality safety applications.
Class Name	KENO V.a Training Course
Class Dates	June 25 – 28, 2018
Location	Y-12 National Security Complex, Oak Ridge, TN
Number of Attendees	16
Short Description	The class provided an overview of the SCALE system, and instruction in building criticality safety models including geometry descriptions, material specifications, and Monte Carlo theory and execution.